Journal of the

Electrochemical Society

DECEMBER 1950 VOLUME 97 • NUMBER 12

CONTENTS

Some Rare Earth Activated Phosphors. *H. G. Jenkins and A. H. McKeag*. 415

Refining of Magnesium by Vaporization at Extremely Low Pressure. *R. R. Rogers and G. E. Viens*. 419

The Relative Reliability of Aluminum and Zinc Starting Sheets for the Electrodeposition of Zinc. *Glen C. Ware and Kenneth B. Higbie*. 425

Detection of Soil Removal in Metal Cleaning by the Radioactive Tracer Technique. *J. C. Harris, R. E. Kamp, and W. H. Yanko*. 430

Studies of Time-Potential Changes on an Electrode Surface during Current Interruption, I. Zinc-Steel Couple in Synthetic Sea Water. *Sigmund Schuldiner and Roger E. White*. 433

Effect of Magnetic Transformation at the Curie Temperatures on Oxidation Rates of Chromium-Iron Alloys. *Herbert H. Uhlig and Anton de S. Brasunas*. 448

Studies on Galvanic Couples, III. Polarization and Cathodic Protection. *H. D. Holler*. 453

DISCUSSION SECTION. 462

Current Affairs

Buffalo Meeting Attracts Largest Fall Attendance. 231C

Activities of the Board of Directors. 233C

Division News. 233C

Section News. 234C

Personals. 235C

New Members. 236C

Book Reviews. 236C

Future Meetings of Other Organizations. 238C

Announcements from the Publishers. 238C

Notes from Industry. 238C

Recent Patents. 239C

Employment Situations. 240C

Electrochemical Society Prizes and Awards. 241C

INDEX. 243C

H. H. UHLIG, *Editor*

NORMAN HACKERMAN, *Technical Editor* F. L. LAQUE, *Business Manager* R. M. BURNS, *Consultant*

ELEANOR REID, *Managing Editor* H. B. LINFORD, *Associate Editor* U. B. THOMAS, *Associate Editor* R. G. ELLIS, *Advertising Manager*

Divisional Editors

J. M. BIALOSKY, *Corrosion* ABNER BRENNER, *Electrodeposition* N. C. CAHOON, *Battery* H. C. FROELICH, *Electronics*

W. C. GARDINER, *Industrial Electrolytic* A. E. PAVLISH, *Electrothermic* R. R. RALSTON, *Electric Insulation* W. D. ROBERTSON, *Theoretical* SHERLOCK SWANN, Jr., *Electro-Organic*

Published monthly by The Electrochemical Society, Inc., Mt. Royal and Guilford Aves., Baltimore 2, Md., combining the JOURNAL and TRANSACTIONS OF THE ELECTROCHEMICAL SOCIETY. Editorial Office: 235 W. 102nd St., New York 25, N. Y. Statements and opinions given in articles and papers in the JOURNAL OF THE ELECTROCHEMICAL SOCIETY are those of the contributors, and The Electrochemical Society assumes no responsibility for them. Subscription: $7.50 to members, $10.00 to nonmembers. Single copies $1.00 to members, $1.25 to nonmembers. Copyright 1950 by The Electrochemical Society. Entered as second-class matter November 15, 1947, at the Post Office at Baltimore, Md., under the act of August 24, 1912.

stop plating rejects caused by incomplete cleaning

my face was covered . . .

with heavy drawing compound and solid dirt. Alkali cleaning proved ineffective. Rejects ran high. Costs doubled.

10 seconds' soak . .

in Emulsion Cleaner 75 followed by 15 seconds in alkali cleaner eliminates rejects due to faulty cleaning.

Enthone Emulsion Cleaner-75

1 removes stubborn oil, grease and grime almost instantly

2 insures smoother, brighter, more adherent electrodeposits

3 tapped holes, slots, embossments, corners, crevices, sculptured patterns, emerge completely clean

4 ideal for cleaning work before any phosphate treatment to avoid coarse coatings

Write for literature and operating instructions

Enthone inc

442 Elm Street New Haven Conn

Editorial

Does Industry Want Electrochemists?

LETTERS come across your editor's desk from time to time asking for recommendations of recently graduated electrochemists to fill a job. No request is more difficult to answer. It is like receiving an order for a 1950 model Stutz or Moon sports model sedan. It so happens that neither the Stutz nor the Moon are now being made, and neither are electrochemists being trained as such at this mid-century mark.

The letters are answered, therefore, with the suggestion that perhaps a certain chemical engineer would do, or a metallurgist who once took two lectures a week in electrochemistry for one semester. To be perfectly frank, of course, neither man would be called an electrochemist and neither would have more than an elementary concept of what the subject comprised. They might, by the grace of God and intense study, eventually fill the bill.

Not many years ago, electrochemists were formally trained and it was possible then for students to receive degrees in electrochemistry from more than one technical school or university. Alumni of this group made an excellent record not only in the electrochemical industries, but in other industries as well, because of their broad basic training in chemistry, physics, and engineering. But for several reasons, not all of which can be recalled at the moment, universities gave up specialized courses in electrochemistry in favor of expanded courses in physical chemistry, chemical engineering, and metallurgy. Perhaps this was a logical step in view of the trends in student registration toward—at that time—more glamorous subjects, but which have since settled down to unobtrusive levels.

Electrochemistry had a heyday of glamour in the early 1900's, but by 1930 the pendulum had swung in the other direction. Today, however, the true importance of the subject is drawing into focus and electrochemists, adequately trained, are increasingly in demand by industries and research institutions. One reason for the demand lies in numerous new electrochemical processes and products now

(*Continued on next page*)

Editorial (*continued*)

making their impress on the industrial scene. These include bright and high-speed plating, electroforming, electropolishing, new primary cells, electrowinning of manganese and beryllium, and cathodic protection of pipelines. Hundreds of electrochemical problems in addition beg for a solution, but personnel familiar with the literature, techniques, and approaches to electrochemistry are extremely hard to find.

Industries whose continued welfare depends on the solution of these problems, and who look to electrochemistry for improvement of their products, might well look with interest at this state of affairs and explore what should be done. The situation is hardly a happy one with many industries now forced, by and large, to train electrochemists in their own plants or laboratories, accompanied by understandable difficulties and occasionally indifferent results.

Improvement would almost certainly come by again placing with the universities the primary responsibility for training electrochemists. With adequate financial support from industry, there is good reason for believing this could be accomplished.

A practical program in this direction is for industry first to establish scholarships for students in electrochemistry at undergraduate and graduate school levels. Next, industry-supported professorships in electrochemistry should be established, a precedent for which has already been set in other fields. Following this, ample research grants in fundamental electrochemistry should be provided to encourage the continued interest of professor and student, and to guarantee a continued flow of new ideas into the applied branches. Along these same lines, industry should more actively support The Electrochemical Society, since this Society is primarily concerned with the professional development of electrochemists, the advancement of electrochemical research, and the encouragement of able young men to enter the field of electrochemistry.

If these ideas, as a beginning, were adopted and put into force, electrochemistry would rapidly make up for lost time in research and teaching, and trained men would again be available to help push ahead the wheels of electrochemical progress.

Buffalo Meeting Attracts Largest Fall Attendance

Five hundred and fifty electrochemists met at the Statler Hotel in Buffalo, New York, October 11–13, to take part in the largest fall meeting in the Society's history. Attracting the record-breaking attendance was a technical program of unusual scope, offering over seventy papers on batteries, corrosion, electrodeposition, and electro-organic chemistry. In addition to the contributions listed in the program which appeared in the October 1950 issue of the JOURNAL, the following papers were presented:

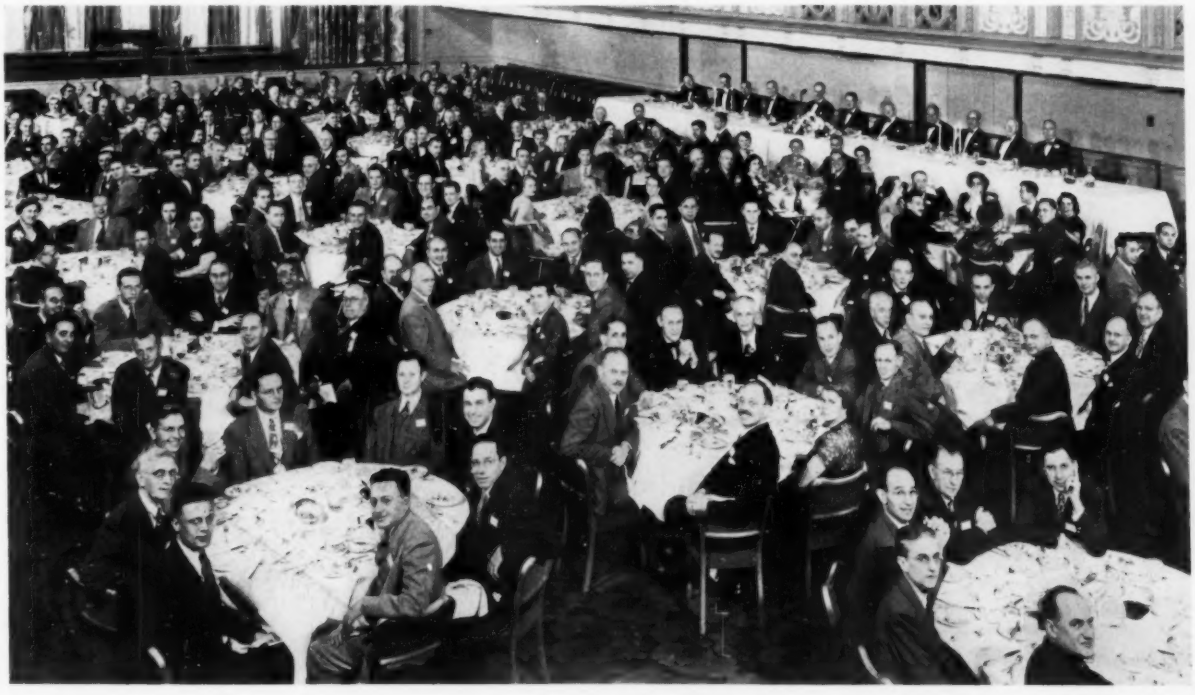
"The Rate of Corrosion of Metals in Acid Solutions Containing Depolarizers" by Melvin Hochberg and Cecil V. King, New York University, New York City.

"Tropical Dry Batteries" and "Water-Activated Primary Cells Utilizing as Depolarizer Persulfates of the Alkali Metals" by I. C. Blake, Burgess Battery Company, Freeport, Illinois.

"Crystalline Phase Types of Manganese Dioxide" by S. Benedict Levin and W. F. Nye, U. S. Signal Corps Engineering Laboratories, Fort Monmouth, New Jersey.

Another interesting feature of the technical program was an all-day round table sponsored by the Electrothermic Division. Wednesday morning, October 11th, under the chairmanship of Mr. G. K. Dreher, was devoted to discussions of electric nonferrous metal melting furnaces and their operation. Arc, induction, and resistor heating were topics covered by builders and users of such furnaces for both the common and rare metals. Mr. G. J. Easter acted as moderator of the Wednesday afternoon session which started with a brief discussion on electric furnaces for brazing and sintering of metals. Attention was then turned to nonmetal operations such as the production of synthetic abrasives, phosphorus and phosphate smelting, the production of graphite, and the electric firing of ceramic wares. Lively discussions of furnace size, electrode spacing, etc., held the audience of nearly one hundred until well after five o'clock.

The social program began Wednesday night, October 11th, with a reception and dinner arranged by the Local Committee. Guest speaker at the dinner was Mr. A. T. O'Neill, vice-president of the Niagara Mohawk Power Corporation and president of The Niagara Falls Power Company. In outlining the "Present and Future Prospects at Niagara Falls," Mr. O'Neill discussed the use of the waters of the Niagara for power pur-



A PARTIAL VIEW OF THE BANQUET GROUP ASSEMBLED IN HONOR OF DR. VINAL, SHOWING THE SPEAKERS' TABLE IN THE BACKGROUND

FORMER SECRETARY R. M. BURNS, HOWARD A. ACHESON, SON OF THE MEDAL DONOR, AND SPEAKERS MARION EPPLEY AND WALLACE R. BRODE JOIN IN CONGRATULATING GEORGE W. VINAL (CENTER) AT MEDAL BANQUET HELD THURSDAY EVENING IN STATLER BALLROOM

poses, pointing out that his company was willing to finance and carry out a proposed new development of additional waters (15,000 to 40,000 cubic feet per second) allotted to the United States in a recent treaty with Canada. For the period, 1909–41, the United States used 20,000 cfs of Niagara water, and since 1941 has had temporary emergency permission to divert an additional 12,500 cfs. The redevelopment of the U. S. share of the River waters, meaning ultimately an additional power capacity of over 1,000,000 kw, cannot be undertaken until it is specifically authorized by act of Congress, and a bill has been introduced in the Congress to provide that only an agency of the Federal Government be allowed to develop the waters.

Following Mr. O'Neill's speech, members and guests enjoyed a show by the Niagara Falls Little Theatre, "Camille in Roaring Camp." The evening concluded with a lively session of square dancing, at which the electrochemists proved themselves quite adept.

On Thursday, October 12th, a luncheon honored Raymond R. Ridgway, late past-president of the Society. The speaker, Mr. Howard Daly, painted a vivid picture of "Ridge" as he was known and admired by his many friends who worked with him at the Norton Company, and in The Electrochemical Society. Remembering the privilege of having been associated with Raymond Ridgway, Mr. Daly reflected the opinions of the group when he said "... Ridge's life was an unusually full one. He lived each day with so much zest, he interested himself in so many worthwhile activities, and he gave so much of himself to every activity and to others that he probably lived more in his 50 years than could most men if they had the privilege of living twice-over their first 50 years. . . ."

Highlighting the nontechnical part of the program was the Acheson Medal Banquet held Thursday night, October 12th, honoring Dr. George W. Vinal for his distinguished contributions to battery science and technology. Following a reception for Dr. Vinal, the banquet took place in the Ballroom of the Statler. The gold medal and $1000 award were presented to Dr. Vinal by President Charles L. Faust, who gave a brief history of the medal commenting, "This is a most fitting locale for the awarding of the eleventh impression of the Acheson Medal, so near Niagara Falls where an electrochemical and electrometallurgical frontier developed as a result of Dr. Acheson's discoveries."

Preceding the medalist's address, Dr. Marion Eppley, President of The Eppley Laboratories, spoke on "G. W. Vinal, A Biographical Appreciation," and Dr. Wallace R. Brode, Associate Director of the National Bureau of Standards, gave a talk on the scientific career of the medalist Dr. Vinal responded with the medalist's address, "Volta and the Volt," an appropriate topic in that the year 1950 marks the sesquicentennial of Volta's discoveries. [Dr. Vinal's speech will appear in the January issue of the JOURNAL.] The ceremonies were fittingly completed with a concert by the Guido Chorus, another feature of the program which was met with much appreciation by those attending the banquet.

Other luncheons held during the convention were sponsored by the Battery, Corrosion, Electrodeposition, Electro-Organic, and Electrothermic Divisions (see DIVISION NEWS).

Completing the well-rounded program were a full schedule for the ladies, and an extensive series of plant trips, including visits to Gould-National Batteries, Incorporated, Westinghouse Electric Corporation, Lionite Abrasives, Ltd.,

GENERAL CHAIRMAN MARVIN J. UDY, PRESIDENT CHARLES L. FAUST, GUEST SPEAKER A. T. O'NEILL AND SECRETARY HENRY B. LINFORD DISCUSS NIAGARA POWER SITUATION

Buffalo Electro-Chemical Company and Huntley Power Station, Colonial Radio Corporation, and E. I. du Pont de Nemours. The meeting was officially closed with a reception and buffet supper at the Red Coach Inn in Niagara Falls, which attracted well over half of the registrants.

The success of the meeting was, of course, due to those members who gave so much time and effort to the careful planning evident throughout the complete program. Largely responsible for the extensive technical sessions were the following chairmen and their committees: I. A. Denison, C. A. Crowley, Julian Glasser, G. J. Easter, R. A. Schaefer, C. C. Rose, J. N. Mrgudich, and Eugene Willihnganz. Committee members who made all local arrangements were: *General and Advisory*, Chairman Marvin J. Udy, A. T. Hinckley, and Ralph B. Hammond; *Arrangements*, Chairman Raymond G. Brown, Keith Demmon, Alfred D. Gate, and Eugene J. Nutting; *Registration*, Chairman, Neal J. Johnson, Allen G. Gray, and Milton Janes; *Entertainment*, Chairman R. B. MacMullin, Co-Chairman James E. Shields, C. N. Richardson, and C. A. Stiegman; *Plant Visits*, Chairman W. C. Gardiner, J. W. Casten, George J. Easter, and W. M. Fotheringham; *Finance*, Chariman J. C. Pernert, A. H. Ballard, C. H. Chappell, Myron C. Cory, B. E. Field, R. L. Murphy, and H. C. Parkman; *Publicity*, Chairman Matthew Weber, Jr., A. E. Jennings, J. S. Newberry, Jack Shore, and J. L. Wood; *Ladies' Program*, Chairman, Mrs. R. R. Ridgway, Mrs. W. C. Gardiner, Mrs. Axel Heilborn, Mrs. James King, Mrs. R. B. MacMullin, and Mrs. Marvin J. Udy.

Activities of the Board of Directors

Members will be interested in the following actions taken at the meeting of the Board of Directors, held at the Buffalo Convention, October 11, 1950.

Due to the fact that there have been many changes in the operation of the Society, it has become necessary to revise radically both the Constitution and the By-Laws of our organization, and at this meeting the Board gave formal approval to a revised form of the Constitution. This Constitution will be presented to the membership-at-large at the annual meeting of the Society in Washington, after which a mail vote of the members will be taken.

The new By-Laws were approved. In general, these By-Laws have been rewritten in such a form as to bring them into line with our present mode of operation.

* * *

It was decided that the Society could not continue to offer bound volumes of the JOURNAL on a pre-subscription basis since rising costs do not allow a close enough estimate to insure that no loss will be incurred in this transaction. However, the JOURNAL will, during the year 1951, carry a notice of binderies available for this service, and it is recommended that individual members, desiring to maintain their libraries of the JOURNAL, negotiate individually with the bindery of their choice.

An item of business directly affecting the members involved the raise in price of the Society pin or button to $7.50 and the price of the key to $15. This was approved.

* * *

It was pointed out by the Secretary that the response to the announcement of the proposed boat trip to Arvida, Canada, in connection with the Montreal Meeting in the fall of 1952, has not been satisfactory, and it is doubtful if this trip can be underwritten by the Society unless considerably more interest is shown by the membership-at-large.

* * *

At the recommendation of the Ways and Means Committee, the following will be the schedule for future meetings:

1951—spring, WASHINGTON; fall, DETROIT
1952—spring, PHILADELPHIA (50th Anniversary of the Founding of the Society); fall, MONTREAL
1953—spring, NEW YORK; fall, MINNEAPOLIS-ST. PAUL
1954—spring, PITTSBURGH; fall, BOSTON
1955—spring, CHICAGO; fall, ROCHESTER

* * *

The Ways and Means Committee reported that they were favorable to the suggestion that The Electrochemical Society establish a monograph series, and studies are now being conducted to further this proposal.

* * *

In order to more clearly define qualifications for membership, the Ways and Means Committee recommended and the Board approved the following suggestions:

1. To accept members' signatures on the application blank as witness of approval of that candidate for membership.
2. To accept the fact that if the person is making application to the Society for membership, he is interested in the field.
3. To accept a Ph.D. degree in any branch of engineering or science in lieu of three years' technical experience.
4. To accept experience in a technical field as covering the experience requirement of the Constitution.

DIVISION NEWS

Battery Division

The Battery Division held its regular business meeting and election of officers at a special luncheon, October 13th, at the Buffalo convention. Almost half the 220 members of the Division attended the luncheon. Dr. John N. Mrgudich, Winchester Repeat ng Arms Company, was elected to succeed Clarence C. Rose, retiring Chairman of the Division. Dr. Eugene Willihnganz, Gould-National Battery Corporation, follows Dr. Mrgudich as Vice-Chairman. Upton B. Thomas, Bell Telephone Laboratories, continues as Secretary-Treasurer. Dr. J. E. White, Naval Research Laboratories, and E. A. Schumacher, National Carbon Company, are Members-at-Large of the Executive Committee.

The new Chairman said he would be delighted to have members suggest subjects for future meetings of the Division. He called attention to the plight of a new member of the Society on attending his first convention and asked that the Division do its share in making these new men welcome.

U. B. THOMAS *Secretary-Treasurer*

Corrosion Division

The technical symposia of the Division were well attended throughout the three sessions held Wednesday morning and afternoon, and Thursday morning. Twenty-one papers were presented and all of them provoked considerable dis-

cussion both in the meetings and in the halls afterward.

The business meeting, which was held on Wednesday afternoon at 5:00 P.M., was devoted to the election of new officers for the coming year. They are Chairman, Norman Hackerman; Vice-Chairman, Harry R. Copson; and Secretary-Treasurer, Jerome M. Bialosky, Carnegie-Illinois Steel Corporation, 234 Atwood Street, Pittsburgh 13, Pennsylvania.

In order to try to maintain the standard of quality set by this year's meeting, the officers have already started planning for the Division meeting in the fall of 1951. They would appreciate receiving any pertinent advice, particularly suggestions for symposium topics.

NORMAN HACKERMAN, *Chairman*

Electrodeposition Division

The annual meeting and luncheon of the Electrodeposition Division was held Friday noon, October 13th, as a part of the Fall Meeting of the Society in Buffalo. About thirty members of the Division were present when the meeting was called to order by Chairman R. A. Schaefer.

The first item of business was a consideration of the revised by-laws of the Division and presented by a committee headed by R. A. Woofter. After some discussion the committee accepted minor changes in Article 2, Section 2; Article 6, Section 1; Article 6, and Section 1, Part D. A motion by L. R. Westbrook, seconded by C. L. Faust, that the Division adopt the by-laws as changed was passed.

Nominations for new officers of the Division were presented by L. R. Westbrook, Chairman of the Committee. A motion by C. L. Faust, seconded by H. B. Linford, that nominations be closed and that the Secretary be instructed to cast a unanimous vote for the slate of officers presented by the Committee was passed. The new officers of the Division to hold office for the next two years are:

Chairman—R. A. WOOFTER
Vice-Chairman—M. L. HOLT
Secretary-Treasurer—C. A. SNAVELY
Member-at-Large of the Executive Committee—ABNER BRENNER
Member of the Executive Committee, Past Chairman—R. A. SCHAEFER.

M. L. HOLT, *Vice-Chairman*

Electro-Organic Division

The Electro-Organic Division held a short symposium during the Buffalo meeting. On Thursday morning two papers were presented dealing with the reduction of salicylic acid to aldehyde and aliphatic nitro compounds to hydroxylamines.

On Friday, the Division held its business meeting and luncheon. Twelve senior members and officers were present. By unanimous vote the following new officers were elected for 1950–52: Chairman, Hans Neumark; Vice-Chairman, Christopher L. Wilson; and Secretary-Treasurer, Harold M. Scholberg. These new officers were duly installed.

Plans are under way for the 1951 fall symposium. Included in the program will be papers dealing with polarography, since many polarographers have expressed the belief that the Division is the proper place to discuss their work. A round-table discussion on "Electro-Organic Developments" will be held during the symposium in 1951.

There are about fifty subscribing members of the Division but many more people attend the functions. Interest in electro-organic chemistry is growing. New developments such as the electrochemical fluorination of organic compounds are sparking this growth.

Publishing houses have recently expressed the view that members of the Electro-Organic Division should consider themselves to be the proper people for writing monographs and books dealwith the electro-organic developments. Progress in this direction was briefly reported.

HAROLD M. SCHOLBERG, *Secretary-Treasurer*

SECTION NEWS

Chicago Section

Dr. H. M. Scholberg, of the Minnesota Mining & Manufacturing Company, spoke before the October 5th meeting of the Section, held at the Chicago Engineers' Club. The subject of his talk was "Fluorination of Organic Compounds."

According to Dr. Scholberg, the consumption of fluorinated organic compounds is steadily increasing in our industrial market and promises to grow at an even faster rate. In connection with increased consumption, the speaker, who heads his company's research in electrochemical fluorination, covered the methods of electrofluorination of several basic types of organic compounds. Of additional interest was a discussion of some of the newer fluorinated organic compounds and their possible industrial applications.

J. H. CONOLLY, *Secretary*

Cleveland Section

The Cleveland Section of The Electrochemical Society held its first meeting of the current season at the Cleveland Engineering Society on October 3rd. The dinner was preceded by a social hour and followed by the technical meeting at 8:00 p.m. The attendance of forty-nine members and guests was one of the largest for the local section.

This was the first Section to be honored by a visit of the Society's president, Dr. Charles L. Faust. After the dinner Dr. Faust spoke on Society matters of interest and then addressed the group on the subject "Some Metallurgical Aspects of Electrochemistry."

The speaker pointed out that the results and course of surface reactions can be changed because of effects related to the method of smoothing the surface. Smoothing by electrodeposition of metals and electropolishing and chemical polishing were discussed relative to mechanical polishing methods. The latter were referred to as those making use of belts, wheels, and papers coated with abrasives, and other cutting methods. While accomplishing the one objective of smoothing, mechanical finishing can so damage or alter a surface as to cause a metal to react differently than might be expected. Yields, initial reactions and rates thereof, side products, structure of electrodeposited metals, frictional properties, and many surface reactions are influenced.

According to Profilometer data, Brush Surface Analyzer charts, reflectivity measurements, and photomicrographs, the nonmechanical methods give unique and practically advantageous smoothing. This is because of the complete absence of cold-working effects. Both general types of finishing (mechanical and nonmechanical) are important, and the best selection or combination can be made when the advantages and limitations of each are considered. Dr. Faust also directed attention to certain aspects of surface metallurgy in relationship to surface chemistry.

L. E. PUCHER, *Secretary*

Midland Section

The Midland Section met for the first time this season on October 5th at the Dow Chemical Company's auditorium. Dr. A. E. Remick of Wayne University, Detroit, was the guest speaker, and previous to the technical meeting a group of Midland members and invited guests from Dow attended dinner with Dr. Remick at the Midland Country Club.

Dr. Remick spoke on "Alternating

Current Electrolysis," a subject on which considerable research has been done in the past six years. The speaker confined his talk to the more fundamental aspects of the research. Polarization capacitance was discussed and a basic equation for its calculation was derived. Oscillograms of current-voltage patterns during a-c electrolysis were shown for several oxidation-reduction systems. Papers on this work were published in the October 1950 JOURNAL.

H. H. ROTH, *Secretary-Treasurer*

New York Metropolitan Section

A larger than usual turnout of the New York Section enjoyed dinner and a fine presentation of "The Present Status of Titanium," at the Holley Hotel on September 27th. The speaker for the occasion was Dr. E. A. Gee, Research Division Head, Pigments Department, E. I. du Pont de Nemours & Company, who has had long experience in the preparation and fabrication of ductile titanium metal.

After briefly reviewing the recent history, which culminated in the announcement by Du Pont of the commercial production of titanium, Dr. Gee stated that the entrance of chemical companies into this field is not surprising since the process is chemical rather than metallurgical in nature. He re-emphasized the fact that titanium is not a rare metal in the true sense of the word, and that it is only the processing difficulties which have kept it off the market. There is a good deal more titanium available than copper, lead, and zinc combined, but its reactivity with the gases of the atmosphere and the deleterious effect of these gases on its properties make production of the metal difficult.

Although the iodide process produces the purest material, this seems fated to remain in the laboratory stage and the magnesium reduction of titanium tetrachloride is the one adopted for commercial production. Dr. Gee's company is regularly producing material of purity 99.6 to 99.7 per cent. Another difficulty in fabricating titanium is that the molten metal is practically a universal solvent and thus the problem of what to melt it in becomes rather serious. Graphite is satisfactory where the introduction of small amounts of carbon is not objectionable; otherwise water-cooled copper can be used with the arc method of melting.

Three important properties of titanium which give it promise as a structural material are its light weight, high strength, and good corrosion resistance to many materials. Although it is heavier than aluminum and magnesium, the strength/weight ratio of titanium alloys is among the highest of any known material; and although it does not resist all corrosives by any means, its resistance to chlorides and moist chlorine is excellent and its inertness to sea water is outstanding, placing it in a class with platinum and Hastelloy C.

After reviewing methods of fabrication and joining titanium, Dr. Gee concluded with a summary of its potential outlets in the seven following categories; aircraft power plants, air frames, pyrotechnics, titanium alloys, marine, chemical equipment, and ordnance. He stressed the following points: Its production must still be considered in the experimental stage and it has no proven commercial uses as yet. It can be worked in conventional steel mill equipment and gives great promise as a structural metal at intermediate temperatures. The principal barrier to its immediate adoption by industry is price.

After the excellent presentation, Dr. Gee answered questions from the audience.

F. A. LOWENHEIM, *Secretary-Treasurer*

Washington-Baltimore Section

The first year of the Washington-Baltimore Section has been successfully completed. A series of interesting meetings marked the initial season of this new section and a gratifying enrollment has already been achieved.

The first meeting of this season took place on Saturday afternoon, September 30th, in the form of a family outing at the Pinecrest Recreation Area just north of Washington. Approximately seventy people were present and all enjoyed a good time and an opportunity to meet each other's wives and children.

J. C. WHITE, *Secretary-Treasurer*

Enlarged Staff for MacMullin Associates

R. B. MacMullin Associates, Consulting Chemical Engineers, have announced the opening of new offices at 610 Niagara Building, Niagara Falls, New York. The enlarged staff now includes: R. B. MacMullin, Director; D. W. Hengerer, Pulp & Paper Activities; P. P. Beno, formerly with Durez Plastics & Chemicals, Inc., and R. A. Williamson, formerly with Union Carbide & Carbon Corporation, Process Engineering Division.

Houston Plant for Ethyl Corporation

The Ethyl Corporation has announced construction of a plant for the manufacture of tetraethyl lead at Houston, Texas. Like the one at Baton Rouge, the Houston plant will be completely integrated, which means it will manufacture the intermediate chemicals needed for its antiknock compound operations. Principal units to be included on the 290-acre property on the Houston Ship Channel are buildings for the production of tetraethyl lead, the sodium-lead alloy, sodium, ethyl chloride, ethylene dichloride, and chlorine. Also to be erected is a blender, where tetraethyl lead will be mixed with ethylene dibromide and ethylene dichloride to form Ethyl antiknock compounds.

The Ethyl Corporation now is the world's largest producer of sodium and ethyl chloride, as well as tetraethyl lead and finished antiknock compounds. It is also a major producer of chlorine, benzene hexachloride and salt cake.

Together, the expansion programs at Baton Rouge and the new construction near Houston represent an investment of approximately $100 million in additional Ethyl facilities, and will result in a total capacity double that of the Ethyl plant in Baton Rouge in the year 1945.

Warner Inaugurated at Carnegie Anniversary

John C. Warner, Vice-President of The Electrochemical Society, was inaugurated as President of Carnegie Institute of Technology on October 27th, in the course of a two-day program of ceremonies arranged to celebrate the Institute's 50th anniversary.

Dr. Warner is the fourth president of Carnegie, having been chosen for the post to succeed the late Dr. Robert E. Doherty, who retired in July 1950.

PERSONALS

JOSEPH H. AREHART has been transferred from The Central Engineering Division of the U. S. Rubber Company, New York City, to the company's Mechanical Goods Division, Fort Wayne, Indiana, where he is senior development engineer.

CHARLES G. HARFORD has been appointed Chairman of the Acheson Medal Committee, succeeding A. F. G. CADENHEAD. SHERLOCK SWANN, JR., and E. G. ENCK have been appointed as members

of the committee, replacing G. H. Clamer and R. J. Mackay, whose three-year terms expire this year.

W. N. Hall has joined the Dominion Tar & Chemical Company, Limited, Montreal, as vice-president. Mr. Hall was formerly vice-president of Standard Chemical Company, Limited, of Toronto.

Gilberta G. Torry of the Experimental Laboratory of E. I. du Pont de Nemours & Company, at Cleveland, Ohio, has been transferred to the company's Grasselli Chemicals Department, Experimental Station Building 324, Wilmington, Delaware.

Souren Z. Avedikian, President and Technical Director of Tidings Corporation of America, Larchmont and Mamaroneck, New York, has been awarded a "Commendation for Meritorious Civilian Service for Outstanding Performance of Duty" by the Department of the Army.

Walter H. Prine has been appointed a member of the Sustaining Membership Committee of The Electrochemical Society.

Henry A. Parkin, formerly with Wisconsin United Plastics Company in Appleton, Wisconsin, is now associated with Southern Molded Products Company, Inc., Columbus, Mississippi.

J. E. MILLS

J. E. Mills, a member of The Electrochemical Society since 1903, died in Hartsville, South Carolina, at the age of 74.

Dr. Mills's earlier years were spent as an educator at the Universities of North Carolina and South Carolina. In 1921 he entered the Chemical Warfare Service and later joined the National Research Council. In recent years he was Director of Chemical Research for the Sonoco Products Company. He was awarded the Herty Medal in 1944.

H. S. BOOTH

Harold Simmons Booth, Chairman of the Department of Chemistry at Western Reserve University, Cleveland, died recently at the age of 59.

Dr. Booth joined the staff at Western Reserve in 1919, became professor of chemistry in 1937, and chairman of the department in 1942. In the later years of his career he was also consultant for several large companies as well as an influential member of various technical societies. He joined The Electrochemical Society in 1920.

His principal researches were in the field of fluorine chemistry, and he was co-author of the books "Quantitative Analysis" and "Boron Trifluoride and its Derivatives."

NEW MEMBERS

In October, 1950, the following were elected to membership in The Electrochemical Society:

Active Members

Theodore W. Blickwedel, Sylvania Electric Products Inc., mailing add: 338 West Fourth Street, Emporium, Pennsylvania (Electrodeposition and Electric Insulation)

Clarence L. Hildreth, Jr., National Carbon Division, Union Carbide and Carbon Corp., mailing add: 10621 Parkhurst Drive, Cleveland 11, Ohio (Battery, Corrosion, Electrodeposition, and Theoretical Electrochemistry)

John C. R. Kelly, Jr., Westinghouse Electric Corporation, mailing add: 658 Valley Road, Upper Montclair, New Jersey (Electronics and Theoretical Electrochemistry)

William C. Lilliendahl, Westinghouse Electric Corporation, mailing add: 63 Briarcliff Road, Mountain Lakes, New Jersey (Electronics)

Claudius Nielsen, Nielco Laboratories, mailing add: P.O. Box 4703, Detroit 19, Michigan

Clarence G. Ozar, Cowles Chemical Company, mailing add: 7016 Euclid Avenue, Cleveland 3, Ohio (Electrodeposition)

John J. Pannabaker, Vanadium Corporation of America, mailing add: River Road, Youngstown, New York (Electrothermic)

Alan U. Seybolt, General Electric Company, mailing add: 810 Sanders Avenue, Scotia, New York (Rare Metals)

Associate Members

Henry B. Maier, 415 West 118th Street, New York 27, N. Y. (Electrodeposition and Electro-Organic)

Nelson B. Weir, Electric Storage Battery Company, mailing add: Oakdale & Sylvania Avenues, Glenside, Pennsylvania (Battery)

Chemical Translations
by mail
Werner Jacobson, B.S., M.S.
Translator and Chemist
Microfilms Accepted
German, Swedish, Danish-Norwegian, French, Spanish, Portuguese, Italian, Russian, Polish, Chinese.
334 South Mozart Street Chicago 12

BOOK REVIEWS

Primary Batteries by George Wood Vinal. Published by John Wiley & Sons, Inc., New York (Chapman & Hall, Ltd., London), 1950. 336 pages, $5.00.

To those who have known Dr. Vinal and his many years of public service, this book will come as no surprise. It was inevitable. A distinct need for authoritative information on primary batteries has existed for many years. This book is the author's contribution toward this end. Like his previous book on "Storage Batteries," which is now in its 3rd edition, "Primary Batteries" is a noteworthy contribution, and one which will be enthusiastically received. The author's twin publications have done much to dispel the literary vacuum which for too long a time has been characteristic of the battery field. Needless to say, they should be on the bookshelf of anyone who is actively interested in the subjects.

It is natural and desirable that "Primary Batteries" should reflect the author's point of view and his particular interests. Associated with the National Bureau of Standards as he was, Dr. Vinal's viewpoint is primarily that of the consumer rather than that of the manufacturer. On the other hand, in his capacity as chief of the Electrochemistry Section of the Bureau, the author's close relationship with manufacturers and their research staffs has familiarized him with their problems and their viewpoint. The net result is an extremely interesting and readable book, broad in scope, descriptive rather than critical, and elementary rather than highly technical. Outstanding chapters are those on dry cells and standard cells. As is well known, the author is an international authority in these fields. Other commercially available types of primary cells are given adequate coverage in six additional chapters.

Some readers may not find in this book the manufacturing details which they desire. Others may be disappointed because research and research methods are not emphasized. This reviewer would have preferred to find a more comprehensive treatment of electrode potentials and the change in electrode potentials (polarization) as a result of current flow. Such information would facilitate an understanding of the fact that the "working voltage" of a primary cell usually is considerably less than its open circuit voltage. Such information would facilitate the selection of those

battery designs and operating conditions which would decrease polarization to a minimum and thus increase "working voltage" to a maximum. A better understanding of polarization should lead to the development and utilization of primary cells heretofore considered impractical, and also to an increase in the output and efficiency of some of the primary cells which are now in general use. No doubt the author elected to limit his discussion of this important subject because of the dearth of quantitative information pertaining to it. His book reflects the "state of the art," and so omission of a detailed discussion of polarization merely serves to emphasize the fact that this subject has been grossly neglected by investigators in the primary battery field. These comments are not intended as criticism but rather as evidence that a book on so broad a subject cannot be "all things to all people." "Primary Batteries" will serve admirably the purpose for which it was intended.

H. E. Haring

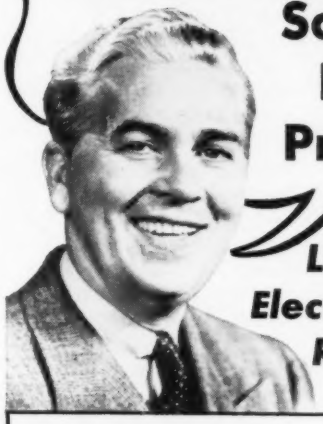
Indium by Maria T. Ludwick. Published by The Indium Corporation of America, New York, 1940. 270 pages. Available to the public at $7.50.

As a comprehensive reference manual for indium this book will serve a useful purpose for all those interested in this element and its newer applications. The book covers the entire pertinent literature from 1863 to 1949 inclusive, demonstrating impressively the amount of work that has been done on the properties and the technology of indium, its compounds and alloys. Three-fourths of the book's contents are devoted to this compilation of papers and patents which are presented under subheadings such as Physical Properties, Qualitative and Quantitative Analysis, Alloys, Chemical Properties, etc. The papers are briefly abstracted and arranged in alphabetical order.

To most readers an arrangement following an historical order might have been more useful, as it would automatically group more recent and probably more reliable information closely together. As it is, and in the complete absence of any critical and authoritative discussion of the references cited, the uninitiated reader seeking reliable data will have to go through the entire literature himself and then form his own opinions.

The first quarter of the book is intended to give a general survey of the chemistry, physics, and technology of

Let BURGESS Solve Your Battery Problems!



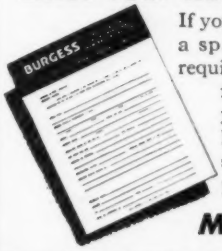
Leader in Electrochemical Research

Burgess is a pioneer in the field of Electrochemical research. For more than 30 years Burgess engineers have led in special battery development and manufacture. The complete Burgess facility . . . engineering . . . design . . . production . . . is available to provide the exact dry battery for any particular application.

Hundreds of Battery Types Already Available

You may find the exact battery for your special requirements among the hundreds of types already developed by Burgess engineers. Standard and special types are handled by Burgess distributors everywhere, thus simplifying replacement battery problems for users of your equipment.

Enter Your Requirements with Us!



If you are in the design stage and need a special battery to meet special requirements, mail the coupon below for a FREE check-sheet to enter your battery specifications with Burgess engineers. They will then send you complete information on your special battery.

MAIL COUPON TODAY!

Burgess Battery Company
Dept. ECS, Freeport, Ill.
Please send, without cost or obligation a Burgess check-sheet for entering our dry battery specifications.
Name..... Title.....
Firm Name.....
Address.....
City..... Zone..... State.....

indium. Regrettably, very little good can be said about this section. On the whole, the presentation is quite careless and disorganized, noncritical, and unscientific. The style is verbose, often trite and chatty, and shows much faulty grammar. Commercialism is freely mixed up with technical discussion. To mention just a few examples: electrical characteristics are discussed under Chemical Properties; several pages of indium solder data are presented outside the chapter on solders; and commercial indium transactions are discussed in detail right alongside of gold-indium phase diagrams. The final result is a peculiar hybrid between a semi-scientific book and one devoted to sales promotion.

Information of value in these chapters includes a table of physical constants of the metal, phase diagrams of indium alloys (the German captions should have been supplemented with English titles), a few photomicrographs, and a table of constants of indium compounds. Completely missing are, for example, at least one reliable and detailed method for the determination of indium (only some general methods are enumerated), or at least one typical indium plating bath formula, some phase diagrams of nonmetallic indium systems, comprehensive thermodynamic data, etc., such as one would expect to find in a monograph on indium.

To sum up, the book is valuable and useful as a collection of indium literature; as a scientific monograph on indium it is wholly inadequate.

H. C. Froelich

FUTURE MEETINGS OF OTHER ORGANIZATIONS

American Society of Heating and Ventilating Engineers, 57th anual meeting, Philadelphia, Pennsylvania, January 22–25.

American Institute of Electrical Engineers, 1951 winter meeting, Hotel Statler, New York City, January 22–26.

American Society for Testing Materials, spring meeting and committee week, Cincinnati, Ohio, March 5–9.

American Society of Mechanical Engineers, spring meeting, Hotel Biltmore, Atlanta, Georgia, April 2–6,

Greater New York Safety Council, 21st annual safety convention and exposition, Hotel Statler, New York City, April 3–6.

ANNOUNCEMENTS FROM PUBLISHERS

Chemical Thermodynamics by Frederick D. Rossini. Published by John Wiley & Sons, Inc., New York, 1950. 514 pages, $6.00.

This book offers an up-to-date review for chemists in industry and research. It presents the fundamental laws of thermodynamics, shows how valid general relations are derived from these laws, and describes applications to physical processes and chemical reactions. The author includes background material and special applications with the complete picture, which is based on his quarter-century of work in chemical thermodynamics.

Industrial Chemicals by W. L. Faith, Donald B. Keyes, and Ronald L. Clark. Published by John Wiley & Sons, Inc., New York, 1950. 652 pages, $8.00.

This volume is a concise coverage of essential technical and economic data for 106 major commercial chemicals. Information is given on the latest manufacturing processes, equations for principal reactions and yield expectations, raw material requirements, etc. Also cost of producing these chemicals, competitive processes, sales trends, plant size, and data charts are included in the book.

NOTES FROM INDUSTRY

Products

Rulan, a flame-retardant plastic electrical insulation, developed by the Du Pont Company's Polychemicals Department, Wilmington, Delaware, is being offered to the wire, cable, and electrical industries. It will not burn after flame has been removed, or when molten; it is non-tracking and retains its electrical properties after long immersion in water at elevated temperatures.

General Ceramics & Steatite Corporation, Keasby, N. J., announces a new line of chemical process equipment made from synthetic resins (developed and produced by Pennsylvania Salt Manufacturing Company) to meet stringent corrosion resistance requirements. The equipment, trade-named Kemplas, is very light in weight yet stronger than other materials used for such purposes. Tests showed no sign of distortion or corrosive attack after two to four years of use with hydrofluoric acids, as compared with several months of life of previous equipment.

International Rectifier Corporation, Los Angeles, Calif., offers a new line of high-voltage selenium-rectifier cartridges. The one shown is rated at 440 volts DC and 10 milliamperes DC;

available in either phenolic, glass or hermetically sealed assemblies from ¼ in. to 1¼ in. OD, or built to individual specifications utilizing either the half-wave or voltage doubler-circuit.

Enthone Incorporated, New Haven, Conn., has announced a new product for the rapid stripping of nickel, tin, lead, and chromium from copper, brass, and other copper alloys without attack upon the base metal (Metal Stripper N-165). The process involves no current. It is stated to be ideal for removal of nickel from such items as percolaters, flashlights, plumbing goods, etc. Folder on request.

RCA Engineering Products Department, Camden, N. J., announces a removable intermediate lens for extending magnification range, as an accessory for EMU-Type RCA electron microscopes, making possible any of ten values of magnification between 900 and 21,000 diameters without breaking vacuum. The lens is supplied with cable, resistor, and installation instructions.

Publications

Federated Metals Division, American Smelting & Refining Company, 120 Broadway, New York, has released a 12-page booklet on anodes for the plating trade. Regular Federated anode products include various copper anodes, and those of lead, tin, brass, and cadmium. The booklet "Anodes" contains full descriptions and illustrations. Copies on request.

W. W. Welch Scientific Company has just issued a 16-page pamphlet on their new Densichron which is a super-sensitive light meter. This light meter

includes the Kalmus-Striker circuit outlined in *Rev. Sci. Instruments*, **19**, 79 (1948). It has a sensitivity of 0.1 microlumen, while light levels of the order of 5×10^{-3} microlumen can be detected by connecting the amplifying tube onto

an oscilloscope. The pamphlet is being distributed on request to the W. M. Welch Scientific Company, 1515 Sedgwick Street, Chicago 10, Ill.

THE HANSON-VAN WINKLE-MUNNING COMPANY of Matawan, New Jersey, has available for limited distribution a technical manual made up of a series of reprints of articles written by D. Gardiner Foulke, Myron B. Diggin, B. C. Case, and L. I. Horner. Of a highly-specialized and technical nature, the articles are valuable descriptions of types, sources, and defects and impurities in plating solutions and purification methods.

RECENT PATENTS

Selected for electrochemists by Fred. W. Dodson, Chairman of the Patent Committee, from the Official Gazette.

July 4, 1950

Fehr, E. B., Application 101,487, Process of Making Electron Emitting Coatings

Brown, H., 2,513,280, Electrodeposition of Nickel from an Acid Bath

Denison, I. A., and Howard, P. L., 2,513,292, Alkaline Primary Battery and Electrolyte Therefor

Waterman, L. C., and Hanson, G. B., 2,513,386, Electric Treater

Williams, M., 2,513,388, Method for Determining Fluid Content and Salinity of Moist Solids

Bardgett, W. E., 2,513,395, Boron-Treated Molybdenum Steel

Franks, R., and Binder, W. O., 2,513,467, Alloy Article for Use at Elevated Temperatures; 2,513,468, Alloy Articles for High Temperature Service; 2,513,469, Alloy Articles for Use at High Temperatures; 2,513,470, Ferrous Alloy Articles Having Great Strength at High Temperatures; 2,513,471, Alloy Articles for High-Temperature Service; 2,513,472, Alloy Articles for Use at High Temperatures

Cope, F. T., 2,513,713, Method of Carburizing Low Carbon Strip Steel

Bailey, E. L., 2,513,778, Heat-Treatin Apparatus

Glock, C. E., 2,513,859, Method of Electroplating of Tin on Ferrous Strip

July 11, 1950

Rasch, C. H., 2,514,415, Storage Battery Paste with Ion Exchange Expander

Dunham, L. S., 2,514,480, Air-Depolarized Cell

Nesbitt, E. A., 2,514,667, Magnetic Alloys

Batina, R. T., 2,514,923, Plating Rack

Drysdale, R. F., and Parker, R. W., 2,514,941, Process for Increasing the Corrosion-Resistance of Metals

Webster, H. G., and Shoemaker, J. H., 2,514,148, Method of Preparing Ferrous Metal for Heat-Treatment

July 18, 1950

Bieber, C. G., and Buck, M. P., 2,515,184, Age Hardenable Nickel Alloys

Bieber, C. G., and Buck, M. P., 2,515,185, Age Hardenable Nickel Alloy; 2,515,186, Age Hardenable Nickel Alloys

Chester, A. E., 2,515,192, Method of Electroplating

Evans, L., 2,515,204, Storage Battery Plate

McKenna, P. M., 2,515,463, Process for Making Titanium Carbide

Fearon, R. E., Thayer, J. M., and Swift, G., 2,515,500, Method and Apparatus for Producing Neutron Logs of Drill Holes; 2,515,501, Neutron Well Logging; 2,515,502, Neutron Well Logging

Kahn, D. S., 2,515,515, Photochemical Preparation of Polypeptides

Thayer, J. M., Fearon, R. E., and Swift, G., 2,515,534, Method and Apparatus for Producing Neutron Logs of Drill Holes

Thayer, J. M., Swift, G., and Fearon, R. E., 2,515,535, Method and Apparatus for Neutron Well Logging

Schumacher, J. C. 2,515,614, Electrolytic Cell

Swift, G., Fearon, R. E., and Thayer, J. M., 2,515,745, Neutron Log

Driscoll, R. A., 2,515,764, Apparatus for Converting Metals

Johnson, R. B., Jr., 2,515,774, High-Temperature Alloy

Epremian, E., 2,515,775, High-Temperature Cobalt Alloy

Lum, J. C., 2,516,008, Composition and Process for Treating Metal Surfaces

Endress, C. H., 2,516,048, Heated Battery

Wells, L. E., 2,516,084, Storage Battery.

July 25, 1950

der Mateosian, E., 2,516,105, Electrolytic Polishing of Metals

Ma, C. C., 2,516,227, Electroplating of Chromium-Molybdenum Alloys

Melsted, V. J., 2,516,474, Electric Furnace for Production of Magnesium

Heberlien, M. F. W., 2,516,515, Method for Making Iron Powder

Holden, A. F., 2,516,516, Salt Bath Quenching Furnace

Hartwig, E. C., and Reed, J. L., 2,516,570, Themperature Control of Electric Resistance Furnaces

Pack, H. G., 2,516,719, Thermoelectric Generator

Unschuld, H. M., 2,516,733, Soybean Oil Refining Process

August 1, 1950

Arditi, M., and De Santis, V. J., 2,516,841, Grid for Electron Discharge Devices

Brasch, A., 2,516,848, Method of Producing Butadiene from Petroleum and Petroleum Fractions

Brasch, A., 2,516,849, Method of Producing Butadiene from Alcohols

Richards, E. A., and Pease, W. E. 2,516,916, Photoelectric Cell

Bristol, F. B., 2,516,952, Insulated Thermocouple with Metallic Coating

Russell, J. L., 2,517,033, Thermocouple Structure

Thompson, A. I., 2,517,053, Insulated Thermocouple Utilizing an Anodized Surface

Dreyfus, L. A., 2,517,098, Induction Furnace

Piper, G. T., and Sutton, O. B., 2,517,132, Primary Cell

Raab, R., 2,517,441, Electrodeposition of Chromium

August 8, 1950

Richards, E. A., and Ellison, L. J., 2,517,602, Metal Contact Rectifier and Photoelectric Cell

Mikulas, W., 2,517,907, Apparatus for Electrotreating Metal Slide Fasteners

Calfee, J. D., and Miller, C. B., 2,518,122, Manufacture of Halogenated Hydrocarbon Oils

August 15, 1950

Daily, R. A., 2,518,527, Manufacture of Storage Batteries

Payson, P., Schempp, R., and Savage, C. H., 2,518,715, Heat- and Corrosion-Resisting Alloy Steel and Articles Thereof

Dreyfus, L. A., 2,518,872, Induction Furnace

Krachenfels, C. J., 2,519,052, Flat Primary Battery

Reinhardt, O. K., 2,519,053, Flat Dry Battery

Woodring, W. B., 2,519,054, Flat Primary Battery

Jeppson, G. N., Van der Pyl, E., and Howe, W. L., 2,519,250, Tunnel Kiln

August 22, 1950

Roberts, R., 2,519,399, Active Material for Alkaline Cells and Method of Preparing the Same

Wilkinson, G. H., 2,519,527, Electric Dry Battery

Okolicsanyi, F., 2,519,785, Thermopile

Rosen, R., 2,519,792, Electrolytic Production of Metallic Uranium

Yeater, M. L., 2,519,807, Ionization Pressure Gauge

Spiro, P., and Wohlgemuth, F., 2,519,858, Electrodeposition of Nickel and Nickel Alloys

Weisz, P. B., 2,519,864, Geiger-Mueller Counter Tube

Bellows, G., Jr., 2,519,872, Electrical Contact Composition or the Like

Tama, M., 2,519,941, Installation for the Measurement and the Control of the Temperature in a Metal Melting and Particularly in a Submerged Resistor Type Induction Furnace

Twele, K. A. W., and Canner, A. D., 2,519,945, Electroplating Apparatus

Simons, J. H., 2,519,983, Electrochemical Process of Making Fluorine-Containing Carbon Compounds

August 29, 1950

Dobrovolny, F. J., Application 642,936, Electrolysis Method and Apparatus

Tama, M., 2,520,349, Induction Apparatus for Metal Coating

Franzen-Lutz, B., and Lutz, J. P., 2,520,394, Apparatus for Determination of Moisture Content

Sonnino, C., 2,520,475, Process for the Chemical Oxidation of Aluminum and Alloys Thereof

Shive, J. N., 2,520,569, Apparatus for and Method of Treating Selenium Rectifiers

Harter, I., Jr., and Evans, S. O., 2,520,598, Tilting Type Electric Induction Furnace

Findley, H. J., 2,520,679, Thermoelectric Generating Device

Wagner, R. M., 2,520,703, Disposal of Waste Cyanide

September 5, 1950

Bente, P. F., Jr., Application 643,002, Production of Alkali Metals

Mullen, J. B., 2,521,082, Electrolytic Production of Silver Chloride

Wiesner, H. J., 2,521,106, Method and Bath for Electropolishing

Miller, N. F., 2,521,124, Infrared Strontium Sulfide Phosphors

Brown, B. K., 2,521,147, Electrolytic Production of Alkanesulfonic Acids

Heberlein, M. F. W., and Bierly, N. R., 2,521,217, Electrolyzing Indium Oxide in Fused Caustic Electrolyte

Wissler, W. A., 2,521,273, Nickel Base Alloy

Schwoegler, E. J., and Hutter, C. A., 2,521,311, Corrosion Inhibiting Compositions

September 12, 1950

Cameron, E. G., Keiper, H. A., Mitschke, A. D., Burlingame, L. G., and Ferguson, R. W., 2,521,687, Electroforming Apparatus

Beeghly, H. F., 2,521,772, Method of Determining the Thickness of a Metal Coating on a Metal Base

Martinez, J. M., and Reinhardt, O. K., 2,521,800, Flat Dry Primary Battery

Longaker, E. L., 2,521,924, Storage Battery

Urbach, F., 2,522,074, Method of Rendering Infrared Radiation Visible Employing Doubly Activated Alkaline Earth Sulfide Phosphors

September 19, 1950

Vaughan, W. E., and Rust, F. F., 2,522,589, Photochemical Reaction of Unsaturated Ethers with Hydrogen Sulfide

Vaughan, W. E., and Rust, F. F., 2,522,590, Photochemical Reaction of Unsaturated Ethers with Aliphatic Mercaptans

Bowen, C. E., 2,522 661, Electrolytic Cell

Defranoux, J. M., 2,523,000, Chromium Nickel Steels

Froelich, H. C., 2,523,005, Method of Stabilizing Phosphors

Jones, S., 2,523,026, Alumina-Based Phosphor

Labino, D., 2,523,030, Electric Glass Furnace

Bryk, P. B., and Ryselin, J. W., 2,523,092, Method for Extraction of Iron

Geiselman, R. A., and Browning, E. H., Jr., 2,523,110, Arc Furnace Regulating System

Struyk, C., and Dollman, S. C., 2,523,160, Electrodeposition of Metals

Struyk, C., and Dollman, S. C., 2,523,161, Electrodeposition of Nickel

Brown, H., 2,523,190, Electrodeposition of Nickel from an Acid Bath

Brown, H., 2,523,191, Electrodeposition of Nickel from an Acid Bath

Smith, L. N., 2,523,253, Electrodeposition Anode

September 26, 1950

Butler, E. W., 2,523,354, Battery Holder for Electrically Operated Devices

Hull, R. O., 2,523,432, Cadmium Plating Process and Composition

Mogck, H., 2,523,443, Device for Protecting Metal from Corrosion

Whitmore, R. A., 2,523,486, Dehairing of Hides

Snyder, R. S., 2,523,973, Plating Rack

Spencer, P. L., 2,524,000 Vacuum Condenser

EMPLOYMENT SITUATIONS

Please address replies to box shown c/o The Electrochemical Society Inc., 235 West 102nd Street, New York 25, N. Y.

Position Available

RESEARCH CHEMIST OR PHYSICIST, B.S. or M.S., young man, at least 2 years' experience, preferably in electrochemistry, inorganic chemistry, or physics of solids. Research and development work in battery field, North Jersey. State qualifications and expected salary. *Reply to Box A-219.*

Position Wanted

CHEMICAL ENGINEER, 31, B.S., W.P.I., three years' experience in electric reduction furnace operation and six years' electroplating in the electronic industry. Extensive background in all phases of metal finishing including industrial engineering aspects. Good appreciation of problems involved and teamwork required in design, plant layout operation, maintenance and quality control. Desires a responsible position in engineering or production development. *Reply to Box 342.*

Electrochemical Society Prizes and Awards

The Edward Goodrich Acheson Medal and Prize

The Edward Goodrich Acheson Gold Medal and $1,000 Prize were founded by Dr. Acheson in August, 1928.

The award is made once every two years (first award at the Fall Meeting, 1929) to the person who shall have made a distinguished "contribution to the advancement of any of the objects, purposes, or activities . . . of the Society. Such contribution may consist of but shall not be limited to (*a*) a discovery pertaining to electrochemistry, electrometallurgy, or electrothermics, (*b*) an invention of a plan, process or device, or research evidenced by a paper embodying information, useful, valuable, or significant in the theory or practice of electrochemistry, electrometallurgy, or electrothermics, and/or (*c*) distinguished services rendered to the Society or its successor."

The award is made without distinction on account of sex, citizenship, race, or residence. See TRANS. ELECTROCHEM. SOC., **54,** 6 (1928).

The Edward Weston Fellowship in Electrochemistry

The Edward Weston Fellowship Fund was established by Dr. Weston in December, 1928. The Fellowship of approximately $1,000 is awarded by the Society whenever funds are available to a graduate student in electrochemistry who possesses marked ability in carrying out research in electrochemistry. The candidate must be under the age of 30 years at the time of the award. The successful candidate may carry out the research at any institution of learning approved of by the Board of Directors of the Society.

The award is made without distinction on account of sex, citizenship, race, or residence.

For applications or further details apply to the Secretary of the Society. See TRANS. ELECTROCHEM. SOC., **55,** 20 (1929); **83,** 6 (1943).

The Electrochemical Society Prize to Young Authors

An annual prize of one hundred dollars was established by the Board of Directors in July, 1928. The prize is awarded to the author of the best paper printed in two volumes of any year of the TRANSACTIONS of the Society. The judges to pass upon the merits of the paper are the Chairman of the Publication Committee; the Secretary of the Society; and three members of the Society, and two alternates, selected by the Chairman of the Publication Committee, the Committee being at liberty to invite the opinion of members not on the committee.

The prize is open to students and graduates, under thirt-one years of age, at any technical school, college, or university, no matter where located. See TRANS. ELECTROCHEM. SOC., **55,** 22 (1929); **92,** viii (1947).

Book Prize to Young Authors

Francis Mills Turner offers an Annual Prize consisting of $50.00 worth of scientific and technical books published by the Reinhold Company, to be given each year to a young author under thirty-one years. The recipient is to be either the first or the second choice selected for the award of the Young Author's Prize and is to be selected by the regularly constituted Prize Committee.

This Prize was gratefully accepted by the Board of Directors at its Nashville Meeting. See TRANS. ELECTROCHEM. SOC., **81,** 3 (1942).

The Roeber Research Fund

This Fund was established in September, 1933, by a group of friends and admirers of the late Dr. E. F. Roeber, one of the founders of the Society and always an ardent enthusiast over the triumphs of electrochemistry. The interest of this fund is to assist university students who are members of the Society (age limit twenty-eight years) requiring special apparatus or supplies for their electrochemical research. Requests for such assistance should be addressed to the Secretary of the Society. See TRANS. ELECTROCHEM. SOC., **64,** 6 (1933).

The Joseph W. Richards Memorial Lectureship

Dr. Joseph William Richards was one of the founders of The Electrochemical Society, and its first President. He was Secretary and Editor of the Society's TRANSACTIONS from 1904 to 1921. His very active and untiring interest in the Society and in the science and art of Electrochemistry reflected itself in the rapid growth of the Society and of the electrochemical industry throughout the world. From the very start, Dr. Richards fostered the international spirit.

The Joseph W. Richards Memorial Lectureship was established in 1929 by a group of friends and admirers of Dr. Richards. The interest of the fund is used to meet the expenses incurred by inviting and entertaining distinguished scientists. See TRANS. ELECTROCHEM. SOC., **57,** 30 (1930).

Winners of Society Prizes and Awards†

Acheson Medalists

EDWARD G. ACHESON*—Artificial Graphite and Carborundum—**56,** 7 (1929).

EDWIN F. NORTHRUP*—Industion Furnaces—**60,** 8 (1931).

COLIN G. FINK—Electrochemistry—**64,** 2 (1933).

FRANK J. TONE*—Electrothermics—**68,** 2, 8 (1935).

† All references, unless otherwise indicated, refer to TRANSACTIONS of the Society.

FREDERICK M. BECKET*—Electrothermics—**72,** 3 (1937).

FRANCIS C. FRARY—Electrometallurgy—**76,** 4 (1939).

CHARLES F. BURGESS*—Electrochemistry—**82,** 3 (1942).

WILLIAM BLUM—Electrodeposition—**86,** 4 (1944).

H. JERMAIN CREIGHTON—Electro-Organic Chemistry—**90,** 5 (1946).

DUNCAN A. MACINNES—Electrochemistry—**94,** 4*P* (1948).

* Deceased.

Weston Fellowship Holders

EDWARD B. SANIGAR—"The Titration of Potassium Cyanide and of Free Cyanide in Silver-Plating Solutions by means of Silver Nitrate"—**58,** 435 (1930); "Electrodeposition of Silver from Sulfate, Nitrate, Fluoborate and Fluoride Solutions"—**59,** 307 (1931).

KARL SOLLNER—"An Experimental Study of Negative Osmosis. Part I"; "Experimental Verification of a New Theory Concerning the Mechanism

Winners of Society Prizes and Awards (cont'd.)

of Anomalous Osmosis. Part II"—**61,** 477, 487 (1932).

MARLIN E. FOGLE—"A Study of Cuprous Oxide Solid Photoelectric Cells"—**66,** 271 (1934).

ROBERT D. BLUE—"Electrodeposition of Aluminum from Non-Aqueous Solutions"—**65,** 339 (1934).

PIERRE A. JACQUET—"Effect of Colloids on Electrodeposition"—**65,** 21 (1934).

MYRON A. COLER—"Electrolytic Processes in the Magnetic Field"—**72,** 247 (1937).

HENRY B. LINFORD—"The Effect of the Speed of Rotation on the Electrode Potentials of Copper and Zinc"—**72,** 461 (1937).

GARTH L. PUTNAM—**71,** 26 (1937).

VITTORIO DE NORA—**73,** 39 (1938).

WALDEMAR P. RUEMMLER—**75,** 52 (1939); **77,** 50 (1940).

RODNEY E. BLACK—**79,** 44 (1941).

WILLIAM E. ROAKE—**81,** 46 (1942).

ROBERT D. MISCH—**93,** 14*P* (1948).

MASSOUD T. SIMNAD—J. ELECTROCHEM. SOC., **94,** 3*N* (1948); **97,** 161*C* (1950).

Winners of Young Authors' Prize

WILLIAM C. GARDINER—"Hydrolysis of Mercurous Sulfate by Cadmium Sulfate Solution in the Weston Normal Cell"; "Oxidation of the Depolarizer in Preparing Standard Cells"; "Crystalline Mercurous Sulfate and the Weston Normal Cell"—**56,** 111 (1929).

DWIGHT K. ALPERN—"Engineering Development of Photovoltaic Cells"—**58,** 275 (1930).

FRANK L. JONES—"Electrodeposition of Tungsten from Aqueous Solutions"—**59,** 461 (1931).

F. W. GODSEY, JR.—"Alternating Current Capacities of Electrolytic Condensers"; and "Potential Gradients in Anodic Films"—**61,** 515, 549 (1932).

B. L. BAILEY—"Hardness Values for Electrochemical Products"—**63,** 369 (1933).

JOSEPH R. HEARD, JR.—"Electro-Organic Oxidations in Concentrated Aqueous Organic Salt Solutions"—**65,** 301 (1934).

UPTON B. THOMAS, JR.— "Electrochemical Behavior of Lead, Lead-Antimony and Lead-Calcium Alloys in Storage Cells"—**68,** 293 (1935).

W. A. JOHNSON—"Studies of Overvoltage: Effect of Fusion of the Cathode and Effect of Temperature on Gas Polarization"—**70,** 259 (1936).

R. SPENCER SOANES—"Potential Distribution in High Current Carbon Arcs in Air"—**72,** 281 (1937).

N. B. NICHOLS—"The Cathode Ray Oscillograph Applied to the Dropping Mercury Electrode"—**73,** 193 (1938).

G. A. MOORE—"Comportment of Palladium-Hydrogen System toward Alternating Electric Current"—**75,** 237 (1939).

J. S. MACKAY—"Photoelectric Cells Sensitive to Long Wave Length Radiation: The Bismuth Sulfide Cell"—**77,** 299 (1940).

EDWARD ADLER—"Photovoltaic Effect"; "Semi-Conductor Photocells and Rectifiers"—**79,** 367, 377 (1941).

SIDNEY SPEIL—"Electrophoretic Dewatering of Clay"—**81,** 119 (1942).

WALTER G. BERL—"A Reversible Oxygen Electrode"—**83,** 253 (1943).

JOHN P. COYLE—"The Extraction of Indium from Complex Lead-Tin Alloys"—**85,** 223 (1944).

AUSTIN E. HARDY—"The Photoconductivity of Zinc-Cadmium Sulfide as Measured with the Cathode-Ray Oscillograph"—**87,** 355 (1945).

NORMAN A. NIELSEN—"Passivation of Stainless Steels"—**89,** 167 (1946).

HENRY LEIDHEISER, JR.—"The Influence of Crystal Face on the Electrochemical Properties of a Single Crystal of Copper"—**91,** 95 (1947).

MICHAEL A. STREICHER—"The Dissolution of Aluminum in Sodium Hydroxide Solutions"—**93,** 285 (1948).

J. C. GRIESS, JR.—"The Electrodeposition Behavior of Traces of Silver"; "Electroseparation of Traces of Silver from Palladium"—J. (and TRANS.) ELECTROCHEM. SOC., **95,** 33, 129 (1949).

Winners of Turner Book Prize

SIDNEY SPEIL—"Electrophoretic Dewatering of Clay"—**81,** 119 (1942).

WALTER G. BERL—"A Reversible Oxygen Electrode"—**83,** 253 (1943).

JOHN P. COYLE—"The Extraction of Indium from Complex Lead-Tin Alloys"—**85,** 223 (1944).

JAMES T. WABER—"Stress Corrosion Cracking of Mild Steel"—**87,** 209 (1945).

BURKE CARTWRIGHT—"Electrolysis of Manganese into a Metal Cathode from Suspensions of Manganese Oxide and Carbon in Molten Manganous Chloride"—**89,** 373 (1946).

AUSTIN E. HARDY—"A Combination Phosphorometer and Spectroradiometer for Luminescent Materials"—**91,** 221 (1947).

MICHAEL A. STREICHER—"The Dissolution of Aluminum in Sodium Hydroxide Solutions"—**93,** 285 (1948).

RALPH F. HOECKELMAN—"Salt-Bath Chromizing"—J. (and TRANS.) ELECTROCHEM. SOC., **96,** 262 (1949).

Joseph W. Richards Memorial Lecturers

JOHN A. MATHEWS,* Vice-President and Director of Research, Crucible Steel Company, New York, N. Y. "The Electric Furnace and the Alloy Age," **61,** 143 (1932).

R. S. HUTTON, Goldsmiths' Professor of Metallurgy, University of Cambridge, England. "Faraday and His Electrochemical Researches," **64,** 13 (1933).

W. S. LANDIS,* Vice-President and Director, American Cyanamid Company, New York, N. Y. "Joseph W. Richards, The Teacher—The Industry," **66,** 6 (1934).

KARL K. DARROW, Physicist, Bell Telephone Laboratories, New York, N. Y. "Electricity in Gases," **69,** 67 (1936).

CHARLES H. HERTY,* Director, Herty Foundation Laboratory, Savannah, Ga. "The Utilization of Southern Pine," **73,** 50 (1938).

BRADLEY STOUGHTON, Dean of Engineering, Lehigh University, Bethlehem, Pa. "Modern Marvels of Electrometallurgy," **76,** 29 (1939).

VLADIMIR K. ZWORYKIN, Associate Director of RCA Research Laboratories, Camden, N. J. "The Electron Microscope," **80,** 14 (1941).

B. D. SAKLATWALLA,* Metallurgical Consultant, Pittsburgh, Pa. "Thermal Reactions in Ferro-Alloy Metallurgy, the Basis of Alloy Steel Development," **84,** 13 (1943).

STEWART J. LLOYD, Professor of Chemical Engineering, University of Alabama, University, Ala. "Freedom in Science," **89,** 9 (1946).

OLIVER W. STOREY, Consultant, Burgess Battery Company, Chicago, Ill. "Research in Industry—Is Government Antagonistic to It?" **96,** 3*P* (1949); J. ELECTROCHEM. SOC., **97,** 9*C* (1950).

* Deceased.

Index—Volume 97

(January-December, 1950)

Acetylsalicylic and Salicylic Acids to the Corresponding Aldehydes, The Electrolytic Reduction of—J. A. May and K. A. Kobe 183
Acheson Medallist, G. W. Vinal Chosen as 189*C*
Acid Solution, Effect of Adsorbed Polar Organic Compounds on Activity of Steel in—H. H. Uhlig (D) 462
Acid Solutions, The Effect of Amines on the Electrode Potential of Mild Steel in Tap Water and—N. Hackerman and J. D. Sudbury 109
Acids, Salicylic and Acetylsalicylic, The Electrolytic Reduction of to the Corresponding Aldehydes—J. A. May and K. A. Kobe 183
Adsorbed Polar Organic Compounds on Activity of Steel in Acid Solution, Effect of—N. Hackerman and E. L. Cook 1
Adsorbed Polar Organic Compounds on Activity of Steel in Acid Solution, Effect of—N. Hackerman and E. L. Cook (D) 462
Adsorbed Polar Organic Compounds on Activity of Steel in Acid Solution, Effect of—H. H. Uhlig (D) 462
Adsorbed and Reaction-Product Films on Metals—H. H. Uhlig 215*C*
Aldehydes, The Electrolytic Reduction of Salicylic and Acetylsalicylic Acids to the Corresponding—J. A. May and K. A. Kobe 183
Alloy Plates, Chromium-Tungsten, Electrodeposition of—A. D. Muir (D) 463
Alloy Plates, Chromium-Tungsten, Electrodeposition of—D. G. Rogers and A. A. Burr 67
Alloy Plates, Chromium-Tungsten, Electrodeposition of—D. G. Rogers and A. A. Burr (D) 463
Alloy Plates, Chromium-Tungsten, Electrodeposition of—H. J. Wiesner (D) 463
Alloys, Aluminum, Conditioning for Electroplating—F. Keller and W. G. Zelley 143
Alloys, Chromium-Iron, Effect of Magnetic Transformation at the Curie Temperatures on Oxidation Rates of—H. H. Uhlig and A. de S. Brasunas 448
Alternating Current Electrolysis, Studies on, I. The Nature of Polarization Capacity and Polarization Resistance—M. Shaw and A. E. Remick 324
Alternating Current Electrolysis, Studies on, II. Oscillographic Studies—J. Silverman and A. E. Remick 335
Aluminum Alloys for Electroplating, Conditioning—F. Keller and W. G. Zelley 143
Aluminum, Corrosion Rate and Etch Structures of; Effect of Heat Treatment and Impurities—B. Roald and M. A. Streicher 283
Aluminum, The Electrochemical Behavior of, I. In Solutions of Cerium Sulfate in Sulfuric Acid—J. V. Petrocelli 10
Aluminum and Zinc Starting Sheets for the Electrodeposition of Zinc, The Relative Reliability of—G. C. Ware and K. B. Higbie 425
Amines, The Effect of on the Electrode Potential of Mild Steel in Tap Water and Acid Solutions—N. Hackerman and J. D. Sudbury 109
Amines, Solvent Effect on the Electric Moments of Some—P. A. Geary and J. G. Miller 54
Ammonia, Production of, Using Magnesium Nitride—R. Banks 115*C*
Andrew, K. F., and Gulbransen, E. A.—The Kinetics of the Reactions of Beryllium with Oxygen and Nitrogen and the Effect of Oxide and Nitride Films on its Vapor Pressure 383
Andrew, K. F., and Gulbransen, E. A.—The Kinetics of the Reactions of Vanadium with Oxygen and Nitrogen 396
Announcements from the Publishers 25*C*, 77*C*, 99*C*, 131*C*, 158*C*, 194*C*, 210*C*, 238*C*
Anode Effect in Aqueous Electrolysis—R. W. Herzer (D) 471
Anode Effect in Aqueous Electrolysis—H. H. Kellogg 133
Anode Effect in Aqueous Electrolysis—H. H. Kellogg (D) 471
Anode Effect in Aqueous Electrolysis—A. C. Loonam (D) 471
Anode Effect in Aqueous Electrolysis—D. R. Turner (D) 471
Anode Effect in Aqueous Electrolysis—H. H. Uhlig (D) 471
Anode Layer in the Electrolytic Polishing of Copper—H. F. Walton 219
Antimonates, Calcium—K. H. Butler, *et al.* 117
Application of the Dropping Mercury Electrode to Diazo Chemistry—R. MacLeod Elofson, R. L. Edsberg, and P. A. Mecherly 166
Aqueous Solutions at High Temperatures, Plating Experiments with—S. Senderoff and A. Brenner 361

Banks, R.—Production of Ammonia Using Magnesium Nitride 115*C*
Barium-Magnesium Silicate Phosphors—K. H. Butler and J. G. Cassanos 83
Barnartt, S.—Gold-Plated Electrode for Measurement of Conductance of Electrolytes 235
Battery Division Round-Table Discussions 71*C*
Beeghly, H. F.—An X-Ray Method for Determining Tin Coating Thickness on Steel 152
Beeghly, H. F.—An X-Ray Method for Determining Tin Coating Thickness on Steel (D) 472
Bergin, M. J., *et al.*—Calcium Antimonates 117
Beryllium with Oxygen and Nitrogen, The Kinetics of the Reactions of, and the Effect of Oxide and Nitride Films on its Vapor Pressure—E. A. Gulbransen and K. F. Andrew 383
Beryllium, Zinc, Silicate (Mn) Phosphors, Effect of Thermal History on Color of—S. Jones 25
Beta-Pinene, Reactions of, III. Electrolytic Oxidation—J. B. Redd and J. E. Hawkins 178
Beta-Pinene, Reactions of, III. Electrolytic Oxidation—J. B. Redd and J. E. Hawkins (D) 474
Beta-Pinene, Reactions of, III. Electrolytic Oxidation—A. E. Remick (D) 474
Bikerman, J. J.—On the Determination of the Roughness of Metallic Surfaces (D) 463
Binary Systems of Nitrides and Carbides of Zirconium, Columbium, Titanium, and Vanadium, Phase Relationships in the—P. Duwez and F. Odell 299
Bleach Manufacture, The Control of, by Oxidation Potential—D. J. Pye 245
Bloom, M. C.—A Unified Mechanism of Passivity and Inhibition. Part II (D) 464
Board of Directors, Actions at December 3, 1949, Meeting 51*C*
Board of Directors, Annual Report of 161*C*
Book Reviews 77*C*, 99*C*, 174*C*, 194*C*, 224*C*, 236*C*
Boomgaard, J. van den, and Kroeger, F. A.—The Fluorescence of Magnesium Germanate Activated by Manganese 377
Boundary Anomalies and Artifacts in Electrophoresis—K. G. Stern and M. Reiner 213
Brace, P. H.—Studies on the Structure of Hard Chromium Plate (D) 466
Brasunas, A. de S., and Uhlig, H. H.—Effect of Magnetic

(D) indicates Discussion.

Transformation at the Curie Temperatures on Oxidation Rates of Chromium-Iron Alloys 448
Brenner, A.—Studies on the Structure of Hard Chromium Plate (D) 467
Brenner, A., and Senderoff, S.—Plating Experiments with Aqueous Solutions at High Temperatures 361
Brown, R. H., and Mears, R. B.—A Unified Mechanism of Passivity and Inhibition. Part II 75
Brown, R. H., and Mears, R. B.—A Unified Mechanism of Passivity and Inhibition. Part II (D) 464
Burr, A. A., and Rogers, D. G.—Electrodeposition of Chromium-Tungsten Alloy Plates 67
Burr, A. A., and Rogers, D. G.—Electrodeposition of Chromium-Tungsten Alloy Plates (D) 463
Burr, A. A., and Rogers, D. G.—Theory of Rate Processes as a Means of Studying Plating Reactions 92
Butler, K. H., and Cassanos, J. G.—Barium-Magnesium Silicate Phosphors 83
Butler, K. H., *et al.*—Calcium Antimonates 117
Butler, K. H., and Jerome, C. W.—Calcium Halophosphate Phosphors, I. Analysis of Emission Spectra 265

Calcium Antimonates—K. H. Butler, M. J. Bergin, and V. M. B. Hannaford 117
Calcium Halophosphate Phosphors, I. Analysis of Emission Spectra—K. H. Butler and C. W. Jerome 265
Calcium Reduction, Preparation of Ductile Vanadium by—R. K. McKechnie and A. U. Seybolt 311
Candidates for Office, 1950–51 ..... 20C
Candidates for Office, 1951–52 ..... 221C
Carbides and Nitrides of Zirconium, Columbium, Titanium, and Vanadium, Phase Relationships in the Binary Systems of—P. Duwez and F. Odell 299
Carroll, K. G.—An X-Ray Method for Determining Tin Coating Thickness on Steel (D) 473
Cassanos, J. G., and Butler, K. H.—Barium-Magnesium Silicate Phosphors 83
Cathodic Protection and Polarization, III., Studies on Galvanic Couples—H. D. Holler 453
Cell, Mercury, The Voltage Balance in the—V. de Nora 346
Cells, Measurement of Electromotive Force and Internal Resistance of, during Current Flow, Studies on Galvanic Couples, I—H. D. Holler 271
Cerium Sulfate in Sulfuric Acid, In Solutions of—The Electrochemical Behavior of Aluminum, I—J. V. Petrocelli 10
Chlor-Alkali Committee of the Industrial Electrolytic Division for the Year 1949, Report of the—A. Heilborn 121C
Chloride, Zirconium, Improvements in Methods for the Reduction of, with Magnesium—W. J. Kroll, *et al.* 305
Chlorine Handling Plant, Instrumentation in a Modern—J. M. Hildyard 367
Chlorine, Liquid, Level Measurement—F. S. McCarthy and G. A. Rice 249
Chromium, Ductile—W. J. Kroll, *et al.* 258
Chromium, Improvements in the Electrowinning of—R. R. Lloyd, *et al.* 227
Chromium Plate, Studies on the Structure of Hard—P. H. Brace (D) 466
Chromium Plate, Studies on the Structure of Hard—A. Brenner (D) 467
Chromium Plate, Studies on the Structure of Hard—J. J. Dale (D) 466
Chromium Plate, Studies on the Structure of Hard—P. A. Jacquet (D) 468
Chromium Plate, Studies on the Structure of Hard—A. D. Muir (D) 466
Chromium Plate, Studies on the Structure of Hard—C. A. Snavely and C. L. Faust 99
Chromium Plate, Studies on the Structure of Hard—C. A. Snavely and C. L. Faust (D) 466
Chromium Plate, Studies on the Structure of Hard—M. M. Sternfels (D) 466
Chromium Plate, Studies on the Structure of Hard—A. R. Weill (D) 468
Chromium Plate, Studies on the Structure of Hard—H. J. Wiesner (D) 466
Chromium-Iron Alloys, Effect of Magnetic Transformation at the Curie Temperatures on Oxidation Rates of—H. H. Uhlig and A. de S. Brasunas 448
Chromium-Tungsten Alloy Plates, Electrodeposition of—A. D. Muir (D) 463
Chromium-Tungsten Alloy Plates, Electrodeposition of—D. G. Rogers and A. A. Burr 67
Chromium-Tungsten Alloy Plates, Electrodeposition of—D. G. Rogers and A. A. Burr (D) 463
Chromium-Tungsten Alloy Plates, Electrodeposition of—H. J. Wiesner (D) 463
Cleaning, Metal, Detection of Soil Removal in, by the Radioactive Tracer Technique—J. C. Harris, *et al.* 430
Cocks, H. C.—A Unified Mechanism of Passivity and Inhibition. Part II (D) 465
Colner, W. H., and Francis, H. T.—Cyclic Phenomena Observed in Electropolishing of Silver 237
Columbium, Zirconium, Titanium, and Vanadium, Phase Relationships in the Binary Systems of Nitrides and Carbides of—P. Duwez and F. Odell 299
Complex Species in Organic Polarography—K. G. Stone 63
Conditioning Aluminum Alloys for Electroplating—F. Keller and W. G. Zelley 143
Conductance of Electrolytes, Gold-Plated Electrode for Measurement of—S. Barnartt 235
Control of Bleach Manufacture by Oxidation Potential—D. J. Pye 245
Cook, E. L., and Hackerman, N.—Effect of Adsorbed Polar Organic Compounds on Steel Activity in Acid Solution 1
Cook, E. L., and Hackerman, N.—Effect of Adsorbed Polar Organic Compounds on Activity of Steel in Acid Solution (D) 462
Copper, The Anode Layer in the Electrolytic Polishing of—H. F. Walton 219
Corrosion, Galvanic, Some Potential-Current Relations in, Studies on Galvanic Couples, II—H. D. Holler 277
Corrosion of Metals in Acid Solutions Containing Depolarizers, The Rate of—M. Hochberg and C. V. King 191
Corrosion Rate and Etch Structures of Aluminum; Effect of Heat Treatment and Impurities—B. Roald and M. A. Streicher 283
"Corrosion Research, Forum on," held at Washington, D. C., Nov. 9–10, 1949, Review of—J. J. Harwood and F. Schulman 83C
Corrosion of Silver in Solutions of Ferric Sulfate, The Rate of—H. Salzberg and C. V. King 290
Counterelectrodes for Selenium Rectifiers—A Review of the Literature—W. B. Roberts 181C
Couples, Galvanic, Studies on, I. Measurement of Electromotive Force and Internal Resistance of Cells during Current Flow—H. D. Holler 271
Couples, Galvanic, Studies on, II. Some Potential-Current Relations in Galvanic Corrosion—H. D. Holler 277
Curie Temperatures, Effect of Magnetic Transformation at the, on Oxidation Rates of Chromium-Iron Alloys—H. H. Uhlig and A. de S. Brasunas 448
Current Electrolysis, Alternating, Studies on, I. The Nature of Polarization Capacity and Polarization Resistance—M. Shaw and A. E. Remick 324
Current Electrolysis, Alternating, Studies on, II. Oscillographic Studies—J. Silverman and A. E. Remick 335
Current Flow, Measurement of Electromotive Force and Internal Resistance of Cells during, Studies on Galvanic Couples, I—H. D. Holler 271
Current Interruption, Studies of Time-Potential Changes on an Electrode Surface during, I. Zinc-Steel Couple in Synthetic Sea Water—S. Schuldiner and R. E. White 443

Cyclic Phenomena Observed in Electropolishing of Silver—H. T. Francis and W. H. Colner 237

Dale, J. J.—Studies on the Structure of Hard Chromium Plate (D) 466
Davis, L. P., *et al.*—Improvements in the Electrowinning of Chromium 227
de Ghorain, R. van Male, and Luyckx, A.—Spiraling in Fluorescent Lamps 159
Delahay, P.—A Polarographic Method for the Indirect Determination of Polarization Curves for Oxygen Reduction on Various Metals, I. Description of the Method—Case of Platinum 198
Delahay, P.—A Polarographic Method for the Indirect Determination of Polarization Curves for Oxygen Reduction on Various Metals, II. Application to Nine Common Metals 205
de Nora, V.—The Voltage Balance in the Mercury Cell .. 346
Depolarizers, The Rate of Corrosion of Metals in Acid Solutions Containing—M. Hochberg and C. V. King 191
Der Internationale Scientist, I. Der Franklin und sein Keit—S. Neman 68C
Der Internationale Scientist, II. Der Volta und seine Peils—S. Neman 122C
Detection of Soil Removal in Metal Cleaning by the Radioactive Tracer Technique—J. C. Harris, R. E. Kamp, and W. H. Yanko 430
Diazo Chemistry, Application of the Dropping Mercury Electrode to—R. MacLeod Elofson, *et al.* 166
Diffraction, Electron, Study of the Structure of Zinc Oxide after Hydrogen Treatment—L. Yang 91C
Division News .. 73C, 97C, 127C, 128C, 156C, 193C, 209C, 233C
Ductile Chromium—W. J. Kroll, W. F. Hergert, and L. A. Yerkes 258
Duwez, P., and Odell, F.—Phase Relationships in the Binary Systems of Nitrides and Carbides of Zirconium, Columbium, Titanium, and Vanadium 299

Edsberg, R. L., *et al.*—Application of the Dropping Mercury Electrode to Diazo Chemistry 166
Effect of Adsorbed Polar Organic Compounds on Activity of Steel in Acid Solution—N. Hackerman and E. L. Cook 1
Effect of Amines on the Electrode Potential of Mild Steel in Tap Water and Acid Solutions—N. Hackerman and J. D. Sudbury 109
Effect of Magnetic Transformation at the Curie Temperatures on Oxidation Rates of Chromium-Iron Alloys—H. H. Uhlig and A. de S. Brasunas 448
Effect of Thermal History on Color of Zinc Beryllium Silicate (Mn) Phosphors—S. Jones 25
Electric Moments of Some Amines, Solvent Effect on the—P. A. Geary and J. G. Miller 54
Electrochemical Behavior of Aluminum, I. In Solutions of Cerium Sulfate in Sulfuric Acid—J. V. Petrocelli 10
Electrochemistry of Membranes of High Ionic Selectivity, Recent Advances in the—K. Sollner 139C
Electrochemistry of Stressed Metals, A Review of the—M. T. Simnad 31C
Electrode, Gold-Plated, for Measurement of Conductance of Electrolytes—S. Barnartt 235
Electrode, Mercury, Application of the Dropping to Diazo Chemistry—R. MacLeod Elofson, *et al.* 166
Electrode Potential of Mild Steel in Tap Water and Acid Solutions, The Effect of Amines on the—N. Hackerman and J. D. Sudbury 109
Electrode Surface during Current Interruption, Studies of Time-Potential Changes on an, I. Zinc-Steel Couple in Synthetic Sea Water—S. Schuldiner and R. E. White .. 433
Electrodeposition of Chromium-Tungsten Alloy Plates—A. D. Muir (D) 463
Electrodeposition of Chromium-Tungsten Alloy Plates—D. G. Rogers and A. A. Burr 67
Electrodeposition of Chromium-Tungsten Alloy Plates—D. G. Rogers and A. A. Burr (D) 463
Electrodeposition of Chromium-Tungsten Alloy Plates—H. J. Wiesner (D) 463
Electrodeposition of Metal Powders—G. Wranglen 353
Electrodeposition of Zinc, The Relative Reliability of Aluminum and Zinc Starting Sheets for the—G. C. Ware and K. B. Higbie 425
Electrodialysis of Reduced Keratin Solutions—C. G. Fink and H. A. Golle 59
Electro-Gravitational Method, The Separation of Simple Electrolytes in Solution by an—G. W. Murphy 405
Electrolysis, Alternating Current, Studies on, I. The Nature of Polarization Capacity and Polarization Resistance—M. Shaw and A. E. Remick 324
Electrolysis, Alternating Current, Studies on, II. Oscillographic Studies—J. Silverman and A. E. Remick 335
Electrolysis, Anode Effect in Aqueous—R. W. Herzer (D) 471
Electrolysis, Anode Effect in Aqueous—H. H. Kellogg ... 133
Electrolysis, Anode Effect in Aqueous—H. H. Kellogg (D) 471
Electrolysis, Anode Effect in Aqueous—A. C. Loonam (D) 471
Electrolysis, Anode Effect in Aqueous—D. R. Turner (D) 471
Electrolysis, Anode Effect in Aqueous—H. H. Uhlig (D) 471
Electrolytes, Gold-Plated Electrode for Measurement of Conductance of—S. Barnartt 235
Electrolytes, Simple, The Separation of, in Solution by an Electro-Gravitational Method—G. W. Murphy 405
Electrolytic Hexagonal Nickel—L. Yang 241
Electrolytic Oxidation, III, Reactions of β-Pinene—J. B. Redd and J. E. Hawkins 178
Electrolytic Oxidation, III, Reactions of β-Pinene—J. B. Redd and J. E. Hawkins (D) 474
Electrolytic Oxidation, III, Reactions of β-Pinene—A. E. Remick (D) 474
Electrolytic Polishing of Copper, The Anode Layer in the—H. F. Walton 219
Electrolytic Reduction of Salicylic and Acetylsalicylic Acids to the Corresponding Aldehydes—J. A. May and K. A. Kobe 183
Electromotive Force and Internal Resistance of Cells during Current Flow, Measurement of, Studies on Galvanic Couples, I—H. D. Holler 271
Electron Diffraction Study of the Structure of Zinc Oxide after Hydrogen Treatment—L. Yang 91C
Electrophoresis, Boundary Anomalies and Artifacts in—K. G. Stern and M. Reiner 213
Electroplating, Conditioning Aluminum Alloys for—F. Keller and W. G. Zelley 143
Electropolishing of Silver, Cyclic Phenomena Observed in—H. T. Francis and W. H. Colner 237
Electrowinning of Chromium, Improvements in the—R. R. Lloyd, *et al.* 227
Elofson, R. MacLeod, *et al.*—Application of the Dropping Mercury Electrode to Diazo Chemistry 166
Emission Spectra, I. Analysis of, Calcium Halophosphate Phosphors—K. H. Butler and C. W. Jerome 265
Etch Structures and Corrosion Rate of Aluminum; Effect of Heat Treatment and Impurities—B. Roald and M. A. Streicher 283

Faust, C. L., Presidential Candidate 20C
Faust, C. L., and Snavely, C. A.—Studies on the Structure of Hard Chromium Plate 99
Faust, C. L., and Snavely, C. A.—Studies on the Structure of Hard Chromium Plate (D) 466

Ferguson, A. L.—Presidential Address 186C
Ferric Sulfate, The Rate of Corrosion of Silver in Solutions of—H. Salzberg and C. V. King 290
Films on Metals, Adsorbed and Reaction-Product—H. H. Uhlig 215C
Films, Oxide and Nitride, the Effect of, on its Vapor Pressure and The Kinetics of the Reactions of Beryllium with Oxygen and Nitrogen—E. A. Gulbransen and K. F. Andrew 383
Fink, C. G., and Golle, H. A.—Electrodialysis of Reduced Keratin Solutions 59
Fluorescence of Magnesium Germanate Activated by Manganese—F. A. Kroeger and J. van den Boomgaard 377
Fluorescent Lamps, Spiraling in—H. van Male de Ghorain and A. Luyckx 159
Fonda, G. R.—Review of Articles on Luminescence for 1949 ..... 3C
Fontana, M. G.—A Unified Mechanism of Passivity and Inhibition. Part II (D) 465
Formamide Hydrochloride—G.-M. Schwab 220C
Francis, H. T., and Colner, W. H.—Cyclic Phenomena Observed in Electropolishing of Silver 237
Franklin, Der, und sein Keit, I, Der Internationale Scientist—S. Neman 68C

Gall, J. F., Vice-Presidential Candidate 221C
Gallium and Germanium during 1949, Developments of—J. R. Musgrave 8C
Galvanic Corrosion, II. Some Potential-Current Relations in, Studies on Galvanic Couples—H. D. Holler 277
Galvanic Couples, Studies on, I. Measurement of Electromotive Force and Internal Resistance of Cells during Current Flow—H. D. Holler 271
Galvanic Couples, Studies on, II. Some Potential-Current Relations in Galvanic Corrosion—H. D. Holler 277
Galvanic Couples, Studies on, III. Polarization and Cathodic Protection—H. D. Holler 453
Gas Analysis, The Ultraviolet Method of Continuous—L. G. Glasser 201C
Geary, P. A., and Miller, J. G.—Solvent Effect on the Electric Moments of Some Amines 54
Gee, E. A., *et al.*—Recent Developments in Titanium 49
Gee, E. A., *et al.*—Recent Developments in Titanium (D) 462
Germanate, Magnesium, Activated by Manganese, The Fluorescence of—F. A. Kroeger and J. van den Boomgaard 377
Germanium and Gallium during 1949, Developments of—J. R. Musgrave 8C
Ginther, R. J., *et al.*—A Study of the Mechanism of Sensitized Luminescence of Solids 123
Glasser, L. G.—The Ultraviolet Method of Continuous Gas Analysis 201C
Gold-Plated Electrode for Measurement of Conductance of Electrolytes—S. Barnartt 235
Golle, H. A., and Fink, C. G.—Electrodialysis of Reduced Keratin Solutions 59
Gravitational, Electro-, Method, The Separation of Simple Electrolytes in Solution by an—G. W. Murphy 405
Gulbransen, E. A., and Andrew, K. F.—The Kinetics of the Reactions of Beryllium with Oxygen and Nitrogen and the Effect of Oxide and Nitride Films on its Vapor Pressure 383
Gulbransen, E. A., and Andrew, K. F.—The Kinetics of the Reactions of Vanadium with Oxygen and Nitrogen 396

Hackerman, N., Technical Editor 107C
Hackerman, N., and Cook, E. L.—Effect of Adsorbed Polar Organic Compounds on Steel Activity in Acid Solution 1
Hackerman, N., and Cook, E. L.—Effect of Adsorbed Polar Organic Compounds on Activity of Steel in Acid Solution (D) 462
Hackerman, N., and Sudbury, J. D.—The Effect of Amines on the Electrode Potential of Mild Steel in Tap Water and Acid Solutions 109
Halophosphate Phosphors, Calcium, I. Analysis of Emission Spectra—K. H. Butler and C. W. Jerome 265
Hannaford, V. M. B., *et al.*—Calcium Antimonates 117
Harris, J. C., *et al.*—Detection of Soil Removal in Metal Cleaning by the Radioactive Tracer Technique 430
Harwood, J. J., and Schulman, F.—Review of "Forum on Corrosion Research" held at Washington, D. C., Nov. 9-10, 1949 ..... 83C
Hawkins, J. E., and Redd, J. B.—Reactions of β-Pinene, III. Electrolytic Oxidation 178
Hawkins, J. E., and Redd, J. B.—Reactions of β-Pinene, III. Electrolytic Oxidation (D) 474
Hayes, E. T., *et al.*—Heat Resistance of Zirconium in Several Mediums 316
Heat Resistance of Zirconium in Several Mediums—E. T. Hayes, A. H. Roberson, and R. H. Robertson 316
Heilborn, A.—Report of the Chlor-Alkali Committee of the Industrial Electrolytic Division for the Year 1949 ..... 121C
Heise, G. W.—A Note on the One Hundred and Fiftieth Anniversary of the Voltaic Pile 65C
Hergert, W. F., *et al.*—Ductile Chromium 258
Hergert, W. F., *et al.*—Improvements in Methods for the Reduction of Zirconium Chloride with Magnesium 305
Herzer, R. W.—Anode Effect in Aqueous Electrolysis (D) 471
Higbie, K. B., and Ware, G. C.—The Relative Reliability of Aluminum and Zinc Starting Sheets for the Electrodeposition of Zinc 425
Hildyard, J. M.—Instrumentation in a Modern Chlorine Handling Plant 367
Hochberg, M., and King, C. V.—The Rate of Corrosion of Metals in Acid Solutions Containing Depolarizers 191
Holler, H. D.—Studies on Galvanic Couples, I. Measurement of Electromotive Force and Internal Resistance of Cells during Current Flow 271
Holler, H. D.—Studies on Galvanic Couples, II. Some Potential-Current Relations in Galvanic Corrosion 277
Holler, H. D.—Studies on Galvanic Couples, III. Polarization and Cathodic Protection 453
Homme, V. E., *et al.*—Improvements in the Electrowinning of Chromium 227
Howe, H. E., and Smith, A. A., Jr.—Properties and Uses of Thallium 167C
Hunter, R. M., Presidential Candidate 221C
Hydrochloride, Formamide—G.-M. Schwab 220C
Hydrogen Treatment, An Electron Diffraction Study of the Structure of Zinc Oxide after—L. Yang 91C

Improvements in the Electrowinning of Chromium—R. R. Lloyd, J. B. Rosenbaum, V. E. Homme, L. P. Davis, and C. C. Merrill 227
Improvements in Methods for the Reduction of Zirconium Chloride with Magnesium—W. J. Kroll, W. F. Hergert, and L. A. Yerkes 305
India Section, Inaugural Meeting 126C
Industrial Electrolytic Division for the Year 1949, Report of the Chlor-Alkali Committee of the—A. Heilborn 121C
Infrared Quenching Phosphors, Zinc Sulfide—N. T. Melamed 33
Inhibition, A Unified Mechanism of Passivity and, Part II—M. C. Bloom (D) 464
Inhibition, A Unified Mechanism of Passivity and, Part II—H. C. Cocks (D) 465
Inhibition, A Unified Mechanism of Passivity and, Part II—M. G. Fontana (D) 465
Inhibition, A Unified Mechanism of Passivity and, Part II—R. B. Mears and R. H. Brown 75
Inhibition, A Unified Mechanism of Passivity and, Part II—R. B. Mears and R. H. Brown (D) 464
Inhibition, A Unified Mechanism of Passivity and, Part II—

M. J. Pryor (D) 464
Inhibition, A Unified Mechanism of Passivity and, Part II—H. H. Uhlig (D) 464
Instrumentation in a Modern Chlorine Handling Plant—J. M. Hildyard 367
Ionic Selectivity, High, Recent Advances in the Electrochemistry of Membranes of—K. Sollner 139*C*
Iron-Chromium Alloys, Effect of Magnetic Transformation at the Curie Temperatures on Oxidation Rates of—H. H. Uhlig and A. de S. Brasunas 448
Isotopes, Comment on Separation of—S. J. Lloyd 78*C*

Jacquet, P. A.—Studies on the Structure of Hard Chromium Plate (D) 468
Jenkins, H. G., and McKeag, A. H.—Some Rare Earth Activated Phosphors 415
Jerome, C. W., and Butler, K. H.—Calcium Halophosphate Phosphors, I. Analysis of Emission Spectra 265
Jones, S.—Effect of Thermal History on Color of Zinc Beryllium Silicate (Mn) Phosphors 25

Kamp, R. E., *et al.*—Detection of Soil Removal in Metal Cleaning by the Radioactive Tracer Technique 430
Keller, F., and Zelley, W. G.—Conditioning Aluminum Alloys for Electroplating 143
Kellogg, H. H.—Anode Effect in Aqueous Electrolysis 133
Kellogg, H. H.—Anode Effect in Aqueous Electrolysis (D) 471
Keratin Solutions, Electrodialysis of Reduced—C. G. Fink and H. A. Golle 59
Kinetics of the Reactions of Beryllium with Oxygen and Nitrogen and the Effect of Oxide and Nitride Films on its Vapor Pressure—E. A. Gulbransen and K. F. Andrew 383
Kinetics of the Reactions of Vanadium with Oxygen and Nitrogen—E. A. Gulbransen and K. F. Andrew 396
King, C. V. and Hochberg, M.—The Rate of Corrosion of Metals in Acid Solutions Containing Depolarizers 191
King, C. V., and Salzberg, H.—The Rate of Corrosion of Silver in Solutions of Ferric Sulfate 290
Klick, C. C., *et al.*—A Study of the Mechanism of Sensitized Luminescence of Solids 123
Kobe, K. A., and May, J. A.—The Electrolytic Reduction of Salicylic and Acetylsalicylic Acids to the Corresponding Aldehydes 183
Kroeger, F. A., and Boomgaard, J. van den—The Fluorescence of Magnesium Germanate Activated by Manganese 377
Kroll, W. J., *et al.*—Ductile Chromium 258
Kroll, W. J., *et al.*—Improvements in Methods for the Reduction of Zirconium Chloride with Magnesium 305
Kroll, W. J.—Recent Developments in Titanium (D) 462

Lamps, Spiraling in Fluorescent—R. van Male de Ghorain and A. Luyckx 159
Letters to the Editor 78*C*, 100*C*, 115*C*, 158*C*, 210*C*
Liberti, A., and Sartori, G.—Polarographic Investigation of Mercaptobenzothiazole 20
Liquid Chlorine Level Measurement—F. S. McCarthy and G. A. Rice 249
Litton, F. B.—The Present Status of Titanium Metal 66*C*
Lloyd, R. R., *et al.*—Improvements in the Electrowinning of Chromium 227
Lloyd, S. J.—Comment on Separation of Isotopes 78*C*
Loonam, A. C.— Anode Effect in Aqueous Electrolysis (D) 471
Lui, C. K., *et al.*—Ultraviolet Emitting Phosphor 29
Luminescence, 1949, Review of Articles on—G. R. Fonda 3*C*
Luminescence of Solids, Sensitized, A Study of the Mechanism of—J. H. Schulman, *et al.* 123
Luminescent Materials, Recording Spectroradiometers for—S. L. Parsons, *et al.*— 41
Luyckx, A. and de Ghorain, R. van Male—Spiraling in Fluorescent Lamps 159

Magnesium, Barium-, Silicate Phosphors—K. H. Butler and J. G. Cassanos 83
Magnesium Germanate Activated by Manganese, The Fluorescence of—F. A. Kroeger and J. van den Boomgaard 377
Magnesium, Improvements in Methods for the Reduction of Zirconium Chloride with—W. J. Kroll, *et al.* 305
Magnesium Nitride, Production of Ammonia Using—R. Banks 115*C*
Magnesium, Refining of, by Vaporization at Extremely Low Pressure—R. R. Rogers and G. E. Viens 419
Magnetic Transformation at the Curie Temperatures, Effect of, on Oxidation Rates of Chromium-Iron Alloys—H. H. Uhlig and A. de S. Brasunas 448
Manganese, The Fluorescence of Magnesium Germanate Activated by—F. A. Kroeger and J. van den Boomgaard 377
Marden Prize Winner 208*C*
Martin, A. E., *et al.*—Recording Spectroradiometers for Luminescent Materials 41
May, J. A., and Kobe, K. A.—The Electrolytic Reduction of Salicylic and Acetylsalicylic Acids to the Corresponding Aldehydes 183
McCarthy, F. S., and Rice, G. A.—Liquid Chlorine Level Measurement 249
McKay, R. J., Vice-Presidential Candidate 20*C*
McKeag, A. H., and Jenkins, H. G.—Some Rare Earth Activated Phosphors 415
McKechnie, R. K., and Seybolt, A. U.—Preparation of Ductile Vanadium by Calcium Reduction 311
Mears, R. B., and Brown, R. H.—A Unified Mechanism of Passivity and Inhibition. Part II 75
Mears, R. B., and Brown, R. H.—A Unified Mechanism of Passivity and Inhibition. Part II (D) 464
Mecherly, P. A., *et al.*—Application of the Dropping Mercury Electrode to Diazo Chemistry 166
Melamed, N. T.—Zinc Sulfide Infrared Quenching Phosphors 33
Members, New 24*C*, 54*C*, 79*C*, 101*C*, 116*C*, 130*C*, 158*C*, 175*C*, 195*C*, 210*C*, 224*C*, 236*C*
Membranes of High Ionic Selectivity, Recent Advances in the Electrochemistry of—K. Sollner 139*C*
Mercaptobenzothiazole, Polarographic Investigation of—G. Sartori and A. Liberti 20
Mercury Cell, The Voltage Balance in the—V. de Nora 346
Mercury Electrode, Application of the Dropping to Diazo Chemistry—R. MacLeod Elofson, *et al.* 166
Merrill, C. C., *et al.*—Improvements in the Electrowinning of Chromium 227
Metal Cleaning by the Radioactive Tracer Technique, Detection of Soil Removal in—J. C. Harris, *et al.* 430
Metal Powders, Electrodeposition of—G. Wranglen 353
Metal, Titanium, The Present Status of—F. B. Litton 66*C*
Metallic Surfaces, On the Determination of the Roughness of—J. J. Bikerman (D) 463
Metallic Surfaces, On the Determination of the Roughness of—H. H. Uhlig (D) 463
Metallic Surfaces, On the Determination of the Roughness of—C. Wagner 71
Metallic Surfaces, On the Determination of the Roughness of—C. Wagner (D) 463
Metals, The Platinum: A Review of Their Properties and Uses—E. M. Wise 57*C*
Metals, Stressed, A Review of the Electrochemistry of—M. T. Simnad 31*C*
Miller, J. G., and Geary, P. A.—Solvent Effect on the Electric Moments of Some Amines 54
Muir, A. D.—Electrodeposition of Chromium-Tungsten Alloy Plates (D) 463
Muir, A. D.—Studies on the Structure of Hard Chromium Plate (D) 466
Murphy, G. W.—The Separation of Simple Electrolytes in

Solution by an Electro-Gravitational Method..... 405
Musgrave, J. R.—Developments of Germanium and Gallium during 1949..... 8C

Nagy, R., *et al.*—Ultraviolet Emitting Phosphor..... 29
Neman, S.—Der Internationale Scientist, I. Der Franklin und sein Keit..... 68C
Neman, S.—Der Internationale Scientist, II. Der Volta und seine Peils..... 122C
Neman, S., Letter to the Editor..... 159C
New Members..24C, 54C, 79C, 101C, 116C, 130C, 158C, 175C, 195C, 210C, 224C, 236C
Nickel, Electrolytic Hexagonal—L. Yang..... 241
Nitride, Magnesium, Production of Ammonia Using—R. Banks..... 115C
Nitrides and Carbides of Zirconium, Columbium, Titanium, and Vanadium, Phase Relationships in the Binary Systems of—P. Duwez and F. Odell..... 299
Nitrogen and Oxygen, The Kinetics of the Reactions of Beryllium with, and the Effect of Oxide and Nitride Films on its Vapor Pressure—E. A. Gulbransen and K. F. Andrew 383
Nitrogen and Oxygen, The Kinetics of the Reactions of Vanadium with—E. A. Gulbransen and K. F. Andrew..... 396
Note on the One Hundred and Fiftieth Anniversary of the Voltaic Pile—G. W. Heise..... 65C
Notes from Industry..80C, 101C, 117C, 133C, 159C, 197C, 211C, 226C, 238C

Odell, F., and Duwez, P.—Phase Relationships in the Binary Systems of Nitrides and Carbides of Zirconium, Columbium, Titanium, and Vanadium..... 299
Oscillographic Studies, II, Studies on Alternating Current Electrolysis—J. Silverman and A. E. Remick..... 335
Oxidation, Electrolytic, III, Reactions of β-Pinene—J. B. Redd and J. E. Hawkins..... 178
Oxidation, Electrolytic, III, Reactions of β-Pinene—J. B. Redd and J. E. Hawkins (D)..... 474
Oxidation, Electrolytic, III, Reactions of β-Pinene—A. E. Remick (D)..... 474
Oxidation Potential, The Control of Bleach Manufacture by—D. J. Pye..... 245
Oxidation Rates of Chromium-Iron Alloys, Effect of Magnetic Transformation at the Curie Temperatures on—H. H. Uhlig and A. de S. Brasunas..... 448
Oxide, Zinc, after Hydrogen Treatment, An Electron Diffraction Study of the Structure of—L. Yang..... 91C
Oxygen and Nitrogen, The Kinetics of the Reactions of Beryllium with, and the Effect of Oxide and Nitride Films on its Vapor Pressure—E. A. Gulbransen and K. F. Andrew 383
Oxygen and Nitrogen, The Kinetics of the Reactions of Vanadium with—E. A. Gulbransen and K. F. Andrew..... 396
Oxygen Reduction on Various Metals, A Polarographic Method for the Indirect Determination of Polarization Curves for, I. Description of the Method—Case of Platinum—P. Delahay 198
Oxygen Reduction on Various Metals, A Polarographic Method for the Indirect Determination of Polarization Curves for, II. Application to Nine Common Metals—P. Delahay 205

Parsons, S. L., *et al.*—Recording Spectroradiometers for Luminescent Materials..... 41
Passivity and Inhibition, A Unified Mechanism of. Part II—M. C. Bloom (D)..... 464
Passivity and Inhibition, A Unified Mechanism of. Part II—H. C. Cocks (D)..... 465
Passivity and Inhibition, A Unified Mechanism of. Part II—M. G. Fontana (D)..... 465
Passivity and Inhibition, A Unified Mechanism of. Part II—R. B. Mears and R. H. Brown..... 75
Passivity and Inhibition, A Unified Mechanism of. Part II—R. B. Mears and R. H. Brown (D)..... 464
Passivity and Inhibition, A Unified Mechanism of. Part II—M. J. Pryor (D)..... 464
Passivity and Inhibition, A Unified Mechanism of. Part II—H. H. Uhlig (D)..... 464
Patents, Recent..26C, 79C, 102C, 116C, 132C, 176C, 195C, 210C, 225C, 239C
Pellissier, G. E., and Wicker, E. E.—An X-Ray Method for Determining Tin Coating Thickness on Steel (D)..... 472
Personals..24C, 54C, 78C, 98C, 114C, 130C, 158C, 175C, 193C, 209C, 223C, 235C
Petrocelli, J. V.—The Electrochemical Behavior of Aluminum, I. In Solutions of Cerium Sulfate in Sulfuric Acid..... 10
Phase Relationships in the Binary Systems of Nitrides and Carbides of Zirconium, Columbium, Titanium, and Vanadium—P. Duwez and F. Odell..... 299
Phosphor, Ultraviolet Emitting—R. Nagy, *et al.*..... 29
Phosphors, Barium-Magnesium Silicate—K. H. Butler and J. G. Cassanos..... 83
Phosphors, Calcium Halophosphate, I. Analysis of Emission Spectra—K. H. Butler and C. W. Jerome..... 265
Phosphors, Some Rare Earth Activated—H. G. Jenkins and A. H. McKeag..... 415
Phosphors, Zinc Beryllium Silicate (Mn), Effect of Thermal History on Color of—S. Jones..... 25
Phosphors, Zinc Sulfide Infrared Quenching—N. T. Melamed 33
Pile, Voltaic, A Note on the One Hundred and Fiftieth Anniversary of the—G. W. Heise..... 65C
Pinene, β-, Reactions of, III. Electrolytic Oxidation—J. B. Redd and J. E. Hawkins..... 178
Pinene, β-, Reactions of, III. Electrolytic Oxidation—J. B. Redd and J. E. Hawkins (D)..... 474
Pinene, β-, Reactions of, III. Electrolytic Oxidation—A. E. Remick (D)..... 474
Plate, Hard Chromium, Studies on the Structure of—P. H. Brace (D)..... 466
Plate, Hard Chromium, Studies on the Structure of—A. Brenner (D)..... 467
Plate, Hard Chromium, Studies on the Structure of—J. J. Dale (D)..... 466
Plate, Hard Chromium, Studies on the Structure of—P. A. Jacquet (D)..... 468
Plate, Hard Chromium, Studies on the Structure of—A. D. Muir (D)..... 466
Plate, Hard Chromium, Studies on the Structure of—C. A. Snavely and C. L. Faust..... 99
Plate, Hard Chromium, Studies on the Structure of—C. A. Snavely and C. L. Faust (D)..... 466
Plate, Hard Chromium, Studies on the Structure of—M. M. Sternfels (D)..... 466
Plate, Hard Chromium, Studies on the Structure of—A. R. Weill (D)..... 468
Plate, Hard Chromium, Studies on the Structure of—H. J. Wiesner (D)..... 466
Plated, Gold-, Electrode for Measurement of Conductance of Electrolytes—S. Barnartt..... 235
Plating Experiments with Aqueous Solutions at High Temperatures—S. Senderoff and A. Brenner..... 361
Plating Reactions, Theory of Rate Processes as a Means of Studying—D. G. Rogers and A. A. Burr..... 92
Platinum, Case of—I. Description of the Method, A Polarographic Method for the Indirect Determination of Polarization Curves for Oxygen Reduction on Various Metals—P. Delahay..... 198
Platinum Metals: A Review of Their Properties and Uses—E. M. Wise..... 57C
Polar Organic Compounds, Adsorbed, Effect of on Steel Activity in Acid Solution—N. Hackerman and E. L. Cook 1
Polar Organic Compounds, Adsorbed, Effect of on Steel Activ-

ity in Acid Solution—N. Hackerman and E. L. Cook (D) 462
Polar Organic Compounds, Adsorbed, Effect of on Activity of Steel in Acid Solution—H. H. Uhlig (D) 462
Polarization Capacity and Polarization Resistance, I. The Nature of, Studies on Alternating Current Electrolysis—M. Shaw and A. E. Remick 324
Polarization and Cathodic Protection, III, Studies on Galvanic Couples—H. D. Holler 453
Polarographic Investigation of Mercaptobenzothiazole—G. Sartori and A. Liberti 20
Polarographic Method for the Indirect Determination of Polarization Curves for Oxygen Reduction on Various Metals, I. Description of the Method—Case of Platinum—P. Delahay 198
Polarographic Method for the Indirect Determination of Polarization Curves for Oxygen Reduction on Various Metals, II. Application to Nine Common Metals—P. Delahay 205
Polarography, Organic, Complex Species in—K. G. Stone 63
Polishing, Electrolytic, of Copper, The Anode Layer in the—H. F. Walton 219
Potential, Electrode, of Mild Steel in Tap Water and Acid Solutions, The Effect of Amines on the—N. Hackerman and J. D. Sudbury 109
Potential, Oxidation, The Control of Bleach Manufacture by—D. J. Pye 245
Potential-Current Relations in Galvanic Corrosion, Some, II, Studies on Galvanic Couples—H. D. Holler 277
Powders, Metal, Electrodeposition of—G. Wranglen 353
Preparation of Ductile Vanadium by Calcium Reduction—R. K. McKechnie and A. U. Seybolt 311
Present Status of Titanium Metal—F. B. Litton 66C
Presidential Address—The Society Looks at Itself in a Mirror—A. L. Ferguson 186C
Pressure, Vapor, The Kinetics of the Reactions of Beryllium with Oxygen and Nitrogen and the Effect of Oxide and Nitride Films on its—E. A. Gulbransen and K. F. Andrew 383
Prizes and Awards of the Society 241C
Program, Technical, Buffalo Meeting 205C
Program, Technical, Cleveland Meeting 92C
Properties and Uses of Thallium—H. E. Howe and A. A. Smith, Jr. 167C
Pryor, M. J.—A Unified Mechanism of Passivity and Inhibition. Part II (D) 464
Pye, D. J.—The Control of Bleach Manufacture by Oxidation Potential 245

Quenching Phosphors, Zinc Sulfide Infrared—N. T. Melamed 33

Radioactive Tracer Technique, Detection of Soil Removal in Metal Cleaning by the—J. C. Harris, *et al.* 430
Rare Earth Activated Phosphors, Some—H. G. Jenkins and A. H. McKeag 415
Rate of Corrosion of Metals in Acid Solutions Containing Depolarizers—M. Hochberg and C. V. King 191
Rate of Corrosion of Silver in Solutions of Ferric Sulfate—H. Salzberg and C. V. King 290
Reaction-Product and Adsorbed Films on Metals—H. H. Uhlig 215C
Reactions of β-Pinene, III. Electrolytic Oxidation—J. B. Redd and J. E. Hawkins 178
Reactions of β-Pinene, III. Electrolytic Oxidation—J. B. Redd and J. E. Hawkins (D) 474
Reactions of β-Pinene, III. Electrolytic Oxidation—A. E. Remick (D) 474
Read, H. J., retiring Technical Editor 107C
Recent Advances in the Electrochemistry of Membranes of High Ionic Selectivity—K. Sollner 139C
Recent Developments in Titanium—E. A. Gee, W. H. Van Derhoef, and C. H. Winter, Jr. 49
Recent Patents 26C, 79C, 102C, 116C, 132C, 176C, 195C, 210C, 225C, 239C
Recording Spectroradiometers for Luminescent Materials—S. L. Parsons, A. E. Martin, and S. N. Roberto 41
Rectifiers, Selenium, Counterelectrodes for—A Review of the Literature—W. B. Roberts 181C
Redd, J. B., and Hawkins, J. E.—Reactions of β-Pinene, III. Electrolytic Oxidation 178
Redd, J. B., and Hawkins, J. E.—Reactions of β-Pinene, III. Electrolytic Oxidation (D) 474
Reduction, Calcium, Preparation of Ductile Vanadium by—R. K. McKechnie and A. U. Seybolt 311
Reduction, The Electrolytic, of Salicylic and Acetylsalicylic Acids to the Corresponding Aldehydes—J. A. May and K. A. Kobe 183
Reduction of Zirconium Chloride with Magnesium, Improvements in Methods for the—W. J. Kroll, *et al.* 305
Refining of Magnesium by Vaporization at Extremely Low Pressure—R. R. Rogers and G. E. Viens 419
Reiner, M. and Stern, K. G.—Boundary Anomalies and Artifacts in Electrophoresis 213
Relative Reliability of Aluminum and Zinc Starting Sheets for the Electrodeposition of Zinc—G. C. Ware and K. B. Higbie 425
Remick, A. E.—Reactions of β-Pinene, III. Electrolytic Oxidation (D) 474
Remick, A. E., and Shaw, M.—Studies on Alternating Current Electrolysis, I. The Nature of Polarization Capacity and Polarization Resistance 324
Remick, A. E., and Silverman, J.—Studies on Alternating Current Electrolysis, II. Oscillographic Studies 335
Report, Annual, of Board of Directors 161C
Report, Annual, of the Secretary 161C
Report, Financial, of the Secretary 162C
Report of Tellers of Election 161C
Report, Treasurer's, for 1949 163C
Research in Industry—Is Government Antagonistic to It?—O. W. Storey 9C
Review of the Electrochemistry of Stressed Metals—M. T. Simnad 31C
Review of "Forum on Corrosion Research" held at Washington, D. C., Nov. 9-10, 1949—J. J. Harwood and F. Schulman 83C
Rice, G. A., and McCarthy, F. S.—Liquid Chlorine Level Measurement 249
Richards Memorial Lecture, Research in Industry—Is Government Antagonistic to It?—O. W. Storey 9C
Roald, B., and Streicher, M. A.—Corrosion Rate and Etch Structures of Aluminum; Effect of Heat Treatment and Impurities 283
Roberson, A. H., *et al.*—Heat Resistance of Zirconium in Several Mediums 316
Roberto, S. N., *et al.*—Recording Spectroradiometers for Luminescent Materials 41
Roberts, W. B.—Counterelectrodes for Selenium Rectifiers—A Review of the Literature 181C
Robertson, R. H., *et al.*—Heat Resistance of Zirconium in Several Mediums 316
Rogers, D. G., and Burr, A. A.—Electrodeposition of Chromium-Tungsten Alloy Plates 67
Rogers, D. G., and Burr, A. A.—Electrodeposition of Chromium-Tungsten Alloy Plates (D) 463
Rogers, D. G., and Burr, A. A.—Theory of Rate Processes as a Means of Studying Plating Reactions 92
Rogers, R. R., and Viens, G. E.—Refining of Magnesium by Vaporization at Extremely Low Pressure 419
Rosenbaum, J. B., *et al.*—Improvements in the Electrowinning of Chromium 227
Roughness of Metallic Surfaces, On the Determination of the—J. J. Bikerman (D) 463
Roughness of Metallic Surfaces, On the Determination of the—H. H. Uhlig (D) 463

Roughness of Metallic Surfaces, On the Determination of the—C. Wagner 71
Roughness of Metallic Surfaces, On the Determination of the—C. Wagner (D) 463

Salicylic and Acetylsalicylic Acids to the Corresponding Aldehydes, The Electrolytic Reduction of—J. A. May and K. A. Kobe 183
Salzberg, H., and King, C. V.—The Rate of Corrosion of Silver in Solutions of Ferric Sulfate 290
Sartori, G., and Liberti, A.—Polarographic Investigation of Mercaptobenzothiazole 20
Schuldiner, S., and White, R. E.—Studies of Time-Potential Changes on an Electrode Surface during Current Interruption, I. Zinc-Steel Couple in Synthetic Sea Water ... 433
Schulman, J. H., *et al.*—A Study of the Mechanism of Sensitized Luminescence of Solids 123
Schulman, F., and Harwood, J. J.—Review of "Forum on Corrosion Research" held at Washington, D. C., Nov. 9-10, 1949 ..... 83C
Schwab, G.-M.—Formamide Hydrochloride 220C
Section News 22C, 52C, 73C, 97C, 110C, 129C, 156C, 172C, 193C, 224C, 234C
Selenium Rectifiers, Counterelectrodes for—A Review of the Literature—W. B. Roberts 181C
Senderoff, S., and Brenner, A.—Plating Experiments with Aqueous Solutions at High Temperatures 361
Sensitized Luminescence of Solids, A Study of the Mechanism of—J. H. Schulman, *et al.* 123
Separation of Simple Electrolytes in Solution by an Electro-Gravitational Method—G. W. Murphy 405
Seybolt, A. U., and McKechnie, R. K.—Preparation of Ductile Vanadium by Calcium Reduction 311
Shaw, M., and Remick, A. E.—Studies on Alternating Current Electrolysis, I. The Nature of Polarization Capacity and Polarization Resistance 324
Sheets, Aluminum and Zinc Starting, for the Electrodeposition of Zinc, The Relative Reliability of—G. C. Ware and K. B. Higbie 425
Silicate Phosphors, Barium-Magnesium—K. H. Butler and J. G. Cassanos 83
Silicate (Mn) Phosphors, Zinc Beryllium, Effect of Thermal History on Color of—S. Jones 25
Silver, Cyclic Phenomena Observed in Electropolishing of—H. T. Francis and W. H. Colner 237
Silver, The Rate of Corrosion of, in Solutions of Ferric Sulfate—H. Salzberg and C. V. King 290
Silverman, J., and Remick, A. E.—Studies on Alternating Current Electrolysis, II. Oscillographic Studies 335
Simnad, M. T.—A Review of the Electrochemistry of Stressed Metals 31C
Smith, A. A. Jr., and Howe, H. E.—Properties and Uses of Thallium 167C
Snavely, C. A., and Faust, C. L.—Studies on the Structure of Hard Chromium Plate 99
Snavely, C. A., and Faust, C. L.—Studies on the Structure of Hard Chromium Plate (D) 466
Soil Removal in Metal Cleaning by the Radioactive Tracer Technique, Detection of—J. C. Harris, *et al.* 430
Solids, A Study of the Mechanism of Sensitized Luminescence of—J. H. Schulman, *et al.* 123
Sollner, K.—Recent Advances in the Electrochemistry of Membranes of High Ionic Selectivity 139C
Solvent Effect on the Electric Moments of Some Amines—P. A. Geary and J. G. Miller 54
Some Rare Earth Activated Phosphors—H. G. Jenkins and A. H. McKeag 415
Spectra, Emission, I. Analysis of, Calcium Halophosphate Phosphors—K. H. Butler and C. W. Jerome 265
Spectroradiometers for Luminescent Materials, Recording—S. L. Parsons, *et al.* 41
Spiraling in Fluorescent Lamps—R. van Male de Ghorain and A. Luyckx 159
Stareck, J. E., Vice-Presidential Candidate 221C
Starting Sheets, Aluminum and Zinc, for the Electrodeposition of Zinc, The Relative Reliability of—G. C. Ware and K. B. Higbie 425
Steel in Acid Solution, Effect of Adsorbed Polar Organic Compounds on Activity—N. Hackerman and E. L. Cook. 1
Steel in Acid Solution, Effect of Adsorbed Polar Organic Compounds on Activity of—N. Hackerman and E. L. Cook (D) 462
Steel in Acid Solution, Effect of Adsorbed Polar Organic Compounds on Activity of—H. H. Uhlig (D) 462
Steel, Mild, in Tap Water and Acid Solutions, The Effect of Amines on the Electrode Potential of—N. Hackerman and J. D. Sudbury 109
Steel, An X-Ray Method for Determining Tin Coating Thickness on—H. F. Beeghly 152
Steel, An X-Ray Method for Determining Tin Coating Thickness on—H. F. Beeghly (D) 472
Steel, An X-Ray Method for Determining Tin Coating Thickness on—K. G. Carroll (D) 473
Steel, An X-Ray Method for Determining Tin Coating Thickness on—E. E. Wicker and G. E. Pellissier (D) 472
Steel-Zinc Couple in Synthetic Sea Water, I, Studies of Time-Potential Changes on an Electrode Surface during Current Interruption—S. Schuldiner and R. E. White 433
Stern, K. G. and Reiner, M.—Boundary Anomalies and Artifacts in Electrophoresis 213
Sternfels, M. M.—Studies on the Structure of Hard Chromium Plate (D) 466
Stone, K. G.—Complex Species in Organic Polarography .. 63
Storey, O. W.—Research in Industry—Is Government Antagonistic to It? 9C
Storey, O. W., Vice-Presidential Candidate 20C
Streicher, M. A., and Roald, B.—Corrosion Rate and Etch Structures of Aluminum; Effect of Heat Treatment and Impurities 283
Stressed Metals, A Review of the Electrochemistry of—M. T. Simnad 31C
Studies on Alternating Current Electrolysis, I. The Nature of Polarization Capacity and Polarization Resistance—M. Shaw and A. E. Remick 324
Studies on Alternating Current Electrolysis, II. Oscillographic Studies—J. Silverman and A. E. Remick 335
Studies on Galvanic Couples, I. Measurement of Electromotive Force and Internal Resistance of Cells during Current Flow—H. D. Holler 271
Studies on Galvanic Couples, II. Some Potential-Current Relations in Galvanic Corrosion—H. D. Holler 277
Studies on Galvanic Couples, III. Polarization and Cathodic Protection—H. D. Holler 453
Studies on the Structure of Hard Chromium Plate—P. H. Brace (D) 466
Studies on the Structure of Hard Chromium Plate—A. Brenner (D) 467
Studies on the Structure of Hard Chromium Plate—J. J. Dale (D) 466
Studies on the Structure of Hard Chromium Plate—P. A. Jacquet (D) 468
Studies on the Structure of Hard Chromium Plate—A. D. Muir (D) 466
Studies on the Structure of Hard Chromium Plate—C. A. Snavely and C. L. Faust 99
Studies on the Structure of Hard Chromium Plate—C. A. Snavely and C. L. Faust (D) 466
Studies on the Structure of Hard Chromium Plate—M. M. Sternfels (D) 466
Studies on the Structure of Hard Chromium Plate—A. R. Weill (D) 468
Studies on the Structure of Hard Chromium Plate—H. J. Wiesner (D) 466
Studies of Time-Potential Changes on an Electrode Surface

during Current Interruption, I. Zinc-Steel Couple in Synthetic Sea Water—S. Schuldiner and R. E. White..... 433
Study of the Mechanism of Sensitized Luminescence of Solids—J. H. Schulman, R. J. Ginther, and C. C. Klick..... 123
Sudbury, J. D., and Hackerman, N.—The Effect of Amines on the Electrode Potential of Mild Steel in Tap Water and Acid Solutions..... 109
Sulfate, Ferric, The Rate of Corrosion of Silver in Solutions of—H. Salzberg and C. V. King..... 290
Sulfuric Acid, In Solutions of Cerium Sulfate in—The Electrochemical Behavior of Aluminum, I—J. V. Petrocelli. 10

Temperatures, Curie, Effect of Magnetic Transformation at the, on Oxidation Rates of Chromium-Iron Alloys—H. H. Uhlig and A. de S. Brasunas..... 448
Thallium, Properties and Uses of—H. E. Howe and A. A. Smith, Jr..... 167C
Theory of Rate Processes as a Means of Studying Plating Reactions—D. G. Rogers and A. A. Burr..... 92
Thermal History, Effect of on Color of Zinc Beryllium Silicate (Mn) Phosphors—S. Jones..... 25
Tin Coating Thickness on Steel, An X-Ray Method for Determining—H. F. Beeghly..... 152
Tin Coating Thickness on Steel, An X-Ray Method for Determining—H. F. Beeghly (D)..... 472
Tin Coating Thickness on Steel, An X-Ray Method for Determining—K. G. Carroll (D)..... 473
Tin Coating Thickness on Steel, An X-Ray Method for Determining—E. E. Wicker and G. E. Pellissier (D)..... 472
Titanium Metal, The Present Status of—F. B. Litton..... 66C
Titanium, Recent Developments in—E. A. Gee, *et al.*..... 49
Titanium, Recent Developments in—E. A. Gee, *et al.* (D) 462
Titanium, Recent Developments in—W. J. Kroll (D)..... 462
Titanium, Zirconium, Columbium, and Vanadium, Phase Relationships in the Binary Systems of Nitrides and Carbides of—P. Duwez and F. Odell..... 299
Tracer Technique, Radioactive, Detection of Soil Removal in Metal Cleaning by the—J. C. Harris, *et al.*..... 430
Tungsten-Chromium Alloy Plates, Electrodeposition of—A. D. Muir (D)..... 463
Tungsten-Chromium Alloy Plates, Electrodeposition of—D. G. Rogers and A. A. Burr..... 67
Tungsten-Chromium Alloy Plates, Electrodeposition of—D. G. Rogers and A. A. Burr (D)..... 463
Tungsten-Chromium Alloy Plates, Electrodeposition of—H. J. Wiesner (D)..... 463
Turner, D. R.—Anode Effect in Aqueous Electrolysis (D) 471

Udy, M. J., Vice-Presidential Candidate..... 221C
Uhlig, H. H.—Adsorbed and Reaction-Product Films on Metals..... 215C
Uhlig, H. H.—Anode Effect in Aqueous Electrolysis (D) 471
Uhlig, H. H.—On the Determination of the Roughness of Metallic Surfaces (D)..... 463
Uhlig, H. H.—Effect of Adsorbed Polar Organic Compounds on Activity of Steel in Acid Solution (D)..... 462
Uhlig, H. H.—A Unified Mechanism of Passivity and Inhibition. Part II (D)..... 464
Uhlig, H. H., and Brasunas, A. de S.—Effect of Magnetic Transformation at the Curie Temperatures on Oxidation Rates of Chromium-Iron Alloys..... 448
Ultraviolet Emitting Phosphor—R. Nagy, R. W. Wollentin, and C. K. Lui..... 29
Ultraviolet Method of Continuous Gas Analysis—L. G. Glasser..... 201C
Unified Mechanism of Passivity and Inhibition. Part II—M. C. Bloom (D)..... 464
Unified Mechanism of Passivity and Inhibition. Part II—H. C. Cocks (D)..... 465
Unified Mechanism of Passivity and Inhibition. Part II—M. G. Fontana (D)..... 465
Unified Mechanism of Passivity and Inhibition. Part II—R. B. Mears and R. H. Brown..... 75
Unified Mechanism of Passivity and Inhibition. Part II—R. B. Mears and R. H. Brown (D)..... 464
Unified Mechanism of Passivity and Inhibition. Part II—M. J. Pryor (D)..... 464
Unified Mechanism of Passivity and Inhibition. Part II—H. H. Uhlig (D)..... 464

Vanadium, Ductile, Preparation of, by Calcium Reduction—R. K. McKechnie and A. U. Seybolt..... 311
Vanadium with Oxygen and Nitrogen, The Kinetics of the Reactions of—E. A. Gulbransen and K. F. Andrew..... 396
Vanadium, Zirconium, Columbium, and Titanium, Phase Relationships in the Binary Systems of Nitrides and Carbides of—P. Duwez and F. Odell..... 299
Van Derhoef, W. H., *et al.*—Recent Developments in Titanium..... 49
Van Derhoef, W. H., *et al.*—Recent Developments in Titanium (D)..... 462
Vapor Pressure, The Kinetics of the Reactions of Beryllium with Oxygen and Nitrogen and the Effect of Oxide and Nitride Films on its—E. A. Gulbransen and K. F. Andrew 383
Vaporization at Extremely Low Pressure, Refining of Magnesium by—R. R. Rogers and G. E. Viens..... 419
Viens, G. E., and Rogers, R. R.—Refining of Magnesium by Vaporization at Extremely Low Pressure..... 419
Vinal, G. W., Chosen as Acheson Medallist..... 189C
Volta, Der, und seine Peils, II, Der Internationale Scientist—S. Neman..... 122C
Voltage Balance in the Mercury Cell—V. de Nora..... 346
Voltaic Pile, A Note on the One Hundred and Fiftieth Anniversary of the—G. W. Heise..... 65C

Wagner, C.—On the Determination of the Roughness of Metallic Surfaces..... 71
Wagner, C.—On the Determination of the Roughness of Metallic Surfaces (D)..... 463
Walton, H. F.—The Anode Layer in the Electrolytic Polishing of Copper..... 219
Ware, G. C., and Higbie, K. B.—The Relative Reliability of Aluminum and Zinc Starting Sheets for the Electrodeposition of Zinc..... 425
Weill, A. R.—Studies on the Structure of Hard Chromium Plate (D)..... 468
White, R. E., and Schuldiner, S.—Studies of Time-Potential Changes on an Electrode Surface during Current Interruption, I. Zinc-Steel Couple in Synthetic Sea Water.. 433
Wicker, E. E., and Pellissier, G. E.—An X-Ray Method for Determining Tin Coating Thickness on Steel (D)..... 472
Wiesner, H. J.—Electrodeposition of Chromium-Tungsten Alloy Plates (D)..... 463
Wiesner, H. J.—Studies on the Structure of Hard Chromium Plate (D)..... 466
Winship Prize Winner..... 208C
Winter, C. H. Jr., *et al.*—Recent Developments in Titanium 49
Winter, C. H. Jr., *et al.*—Recent Developments in Titanium (D)..... 462
Wise, E. M.—The Platinum Metals: A Review of Their Properties and Uses..... 57C
Wollentin, R. W., *et al.*—Ultraviolet Emitting Phosphor.. 29
Wranglen, G.—Electrodeposition of Metal Powders..... 353

X-Ray Method for Determining Tin Coating Thickness on Steel—H. F. Beeghly..... 152
X-Ray Method for Determining Tin Coating Thickness on Steel—H. F. Beeghly (D)..... 472

X-Ray Method for Determining Tin Coating Thickness on Steel—K. G. Carroll (D) 473
X-Ray Method for Determining Tin Coating Thickness on Steel—E. E. Wicker and G. E. Pellissier (D) 472

Yang, L.—Electrolytic Hexagonal Nickel 241
Yang, L.—An Electron Diffraction Study of the Structure of Zinc Oxide after Hydrogen Treatment 91C
Yanko, W. H., *et al.*—Detection of Soil Removal in Metal Cleaning by the Radioactive Tracer Technique 430
Yerkes, L. A., *et al.*—Ductile Chromium 258
Yerkes, L. A., *et al.*—Improvements in Methods for the Reduction of Zirconium Chloride with Magnesium 305

Zelley, W. G., and Keller, F.—Conditioning Aluminum Alloys for Electroplating 143
Zinc and Aluminum Starting Sheets for the Electrodeposition of Zinc, The Relative Reliability of—G. C. Ware and K. B. Higbie 425
Zinc Beryllium Silicate (Mn) Phosphors, Effect of Thermal History on Color of—S. Jones 25
Zinc Oxide after Hydrogen Treatment, An Electron Diffraction Study of the Structure of—L. Yang 91C
Zinc, The Relative Reliability of Aluminum and Zinc Starting Sheets for the Electrodeposition of—G. C. Ware and K. B. Higbie 425
Zinc Sulfide Infrared Quenching Phosphors—N. T. Melamed 33
Zinc-Steel Couple in Synthetic Sea Water, I, Studies of Time-Potential Changes on an Electrode Surface during Current Interruption—S. Schuldiner and R. E. White 433
Zirconium Chloride with Magnesium, Improvements in Methods for the Reduction of—W. J. Kroll, *et al.* 305
Zirconium, Columbium, Titanium, and Vanadium, Phase Relationships in the Binary Systems of Nitrides and Carbides of—P. Duwez and F. Odell 299
Zirconium, Heat Resistance of, in Several Mediums—E. T. Hayes, *et al.* 316

The Electrochemical Society

INSTRUCTIONS TO AUTHORS OF PAPERS

Address all correspondence to the Editor, JOURNAL OF THE ELECTROCHEMICAL SOCIETY, 235 W. 102nd St., New York 25, N. Y.

FORM

Manuscripts submitted for publication should be in triplicate to expedite review. They should be typewritten, double-spaced, with $2\frac{1}{2}$–4 cm (1–$1\frac{1}{2}$ in.) margins.

Title should be brief, followed by the author's name and his business or university connection.

Abstract of about 100 words should state the scope of the paper and give a brief summary of results.

ILLUSTRATIONS

Drawings will be reduced to column width, 8 cm ($3\frac{1}{8}$ in.), and after reduction should have lettering at least 0.15 cm ($\frac{1}{16}$ in.) high. Original drawings in India ink on tracing cloth or white paper are preferred. Curves may be drawn on coordinate paper only if the paper is ruled in blue. All lettering must be of lettering-guide quality. See sample drawing on reverse page.

Photographs must be glossy prints and mounted flat.

Captions for all figures must be included on a separate sheet. Captions and figure numbers should not appear in the body of the figure.

General—Figures should be used only when necessary. Omit drawings or photographs of familiar equipment. Figures from other publications are to be used only when the publication is not readily available, and should always be accompanied with written permission for reprinting.

REFERENCES

Literature and patent references should be listed at the end of the paper on a separate sheet, in the order in which they are cited. They should be given in the style adopted by *Chemical Abstracts*. For example:

R. Freas, *Trans. Electrochem. Soc.*, **40,** 109 (1921).

H. T. S. Britton, "Hydrogen Ions," Vol. **1,** p. 309, D. Van Nostrand Co., New York (1943).

H. F. Weiss (To Wood Conversion Co.), U. S. Pat. 1,695,445, Dec. 18, 1928.

UNITS OF MEASUREMENT

Metric units should be used throughout but, where desirable, English units may be given in parentheses.

Corrosion rates in the metric system should preferably be expressed as milligrams per square decimeter per day (mdd), and in the English system as inches penetration per year (ipy).

As regards algebraic signs of potentials, the standard electrode potential for $Zn \rightarrow Zn^{++} + 2e$ is negative; for $Cu \rightarrow Cu^{++} + 2e$, positive.

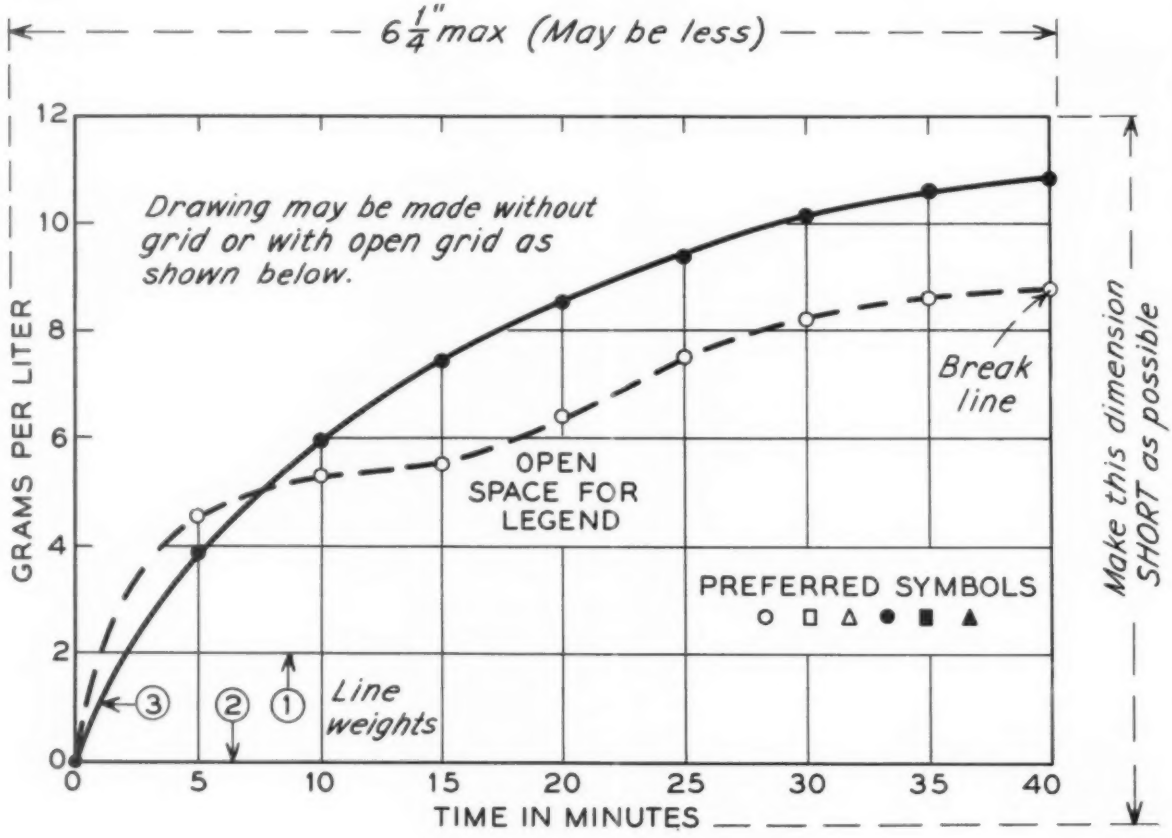
ABBREVIATIONS

Abbreviations should conform with the American Standards Association's list of "Abbreviations for Scientific and Engineering Terms."

GENERAL

Authors should be as brief as is consistent with clarity, and must omit all material which can be regarded as familiar to specialists in the particular field.

The use of proprietary names, trade-marks, and trade names should be avoided if possible. If used, these should be capitalized so that the owner's legal rights are not jeopardized.


6 1/4" max (May be less)
Drawing may be made without grid or with open grid as shown below.
GRAMS PER LITER
TIME IN MINUTES
Break line
OPEN SPACE FOR LEGEND
PREFERRED SYMBOLS
Line weights
Make this dimension SHORT as possible

Remarks: Line weight ② is used for borders and zero lines. When several curves are shown, each may be numbered and described in the caption. Lettering is approx. 1/8".

SAMPLE CURVE DRAWING FOR REDUCTION TO $\frac{1}{2}$ SIZE

Divisions of the Society

Battery
J. N. Mrgudich, Chairman
Eugene Willihnganz, Vice-Chairman
U. B. Thomas, Sec.-Treas.
Bell Telephone Labs.
Murray Hill, N. J.

Corrosion
Norman Hackerman, Chairman
H. R. Copson, Vice-Chairman
J. M. Bialosky, Sec.-Treas.
Carnegie-Illinois Steel Corporation
234 Atwood Street
Pittsburgh 13, Pennsylvania

Electric Insulation
John F. Gall, Chairman
Judson West, Jr., Vice-Chairman
T. D. Callinan, Sec.-Treas.
Naval Research Lab.
Washington 20, D. C.

Electrodeposition
R. A. Wooster, Chairman
M. L. Holt, Vice-Chairman
C. A. Snavely, Sec.-Treas.
Battelle Memorial Institute
505 King Avenue
Columbus, Ohio

Electronics
E. F. Lowry, Chairman
D. H. Wamsley, Vice-Chairman
H. C. Froelich, Vice-Chairman
B. W. Gonser, Vice-Chairman
J. R. Musgrave, Sec.-Treas.
The Eagle-Picher Company
Joplin, Mo.

Electro-Organic
Hans Neumark, Chairman
C. L. Wilson, Vice-Chairman
H. M. Scholberg, Sec.-Treas.
367 Grove Street
St. Paul, Minnesota

Electrothermic
Julian Glasser, Chairman
C. H. Chappell, Vice-Chairman
I. E. Campbell, Sec.-Treas.
Battelle Memorial Institute
Columbus, Ohio

Industrial Electrolytic
A. C. Loonam, Chairman
F. Woodman, Vice-Chairman
Kenneth B. McCain, Sec.-Treas.
Wilbur B. Driver Company
Newark, N. J.

Theoretical Electrochemistry
H. H. Uhlig, Chairman
William von Fischer, Vice-Chairman
W. L. Haden, Sec.-Treas.
Pittsburgh Plate Glass Company
Barberton, Ohio

Local Sections of the Society

Chicago
P. W. Leppla, Chairman
Scott Modjeska, Vice-Chairman
Simon P. Gary, Treasurer
J. H. Conolly, Secretary
407 S. Dearborn Street
Chicago 5, Ill.

Cleveland
C. B. Sanborn, Chairman
H. C. Froelich, Vice-Chairman
N. C. Cahoon, Treasurer
Leo E. Pucher, Secretary
Willard Storage Battery Co.
Cleveland 8, Ohio

Detroit
C. O. Durbin, Chairman
W. P. Innes, 1st Vice-Chairman
M. L. Baty, 2nd Vice-Chairman
A. M. Linn, Sec.-Treas.
United Chromium, Inc.
Detroit, Mich.

Midland
F. W. Koerker, Chairman
H. A. Robinson, Vice-Chairman
H. H. Roth, Sec.-Treas.
The Dow Chemical Co.
Midland, Mich.

New York Metropolitan
H. R. Copson, Chairman
J. S. Mackay Vice-Chairman
F. A. Lowenheim, Sec.-Treas.
Metal & Thermit Corp.
Rahway, N. J.

Niagara Falls
M. J. Udy, Chairman
Allen G. Gray, Vice-Chairman
M. S. Kircher, Sec.-Treas.
Hooker Electrochemical Co.
Niagara Falls, N. Y.

Pacific Northwest
E. C. Gilbert, Chairman
Jos. Schulein, Sec.-Treas.
Oregon State College
Corvallis, Ore.

Philadelphia
Arthur Osol, Chairman
John F. Gall, Vice-Chairman
George F. Temple, Treasurer
J. F. Hazel, Secretary
Dept. of Chem., Univ. of Pa.
Philadelphia 4, Pa.

Pittsburgh
E. K.Camp, Chairman
J. M. Guthrie, Vice-Chairman
M. Simnad, Sec.-Treas.
Carnegie Institute of Technology
Pittsburgh, Pa.

San Francisco
Edward B. Sanigar, Chairman
Charles G. Maier, Vice-Chairman
R. F. Bechtold, Sec.-Treas.
The Dow Chemical Co.
Pittsburg, Calif.

Washington–Baltimore
Paul L. Howard, Chairman
Abner Brenner, Vice-Chairman
J. C. White, Sec.-Treas.
4205 Woodberry Street
University Park, Md.

India
B. K. R. Prasad, Chairman
K. L. Ramaswamy, Vice-Chairman
J. Balachandra, 2nd Vice-Chairman
T. L. Rama Char, Sec.-Treas.
Indian Institute of Science
Bangalore, India

Sustaining Members of The Electrochemical Society

Ajax Electro Metallurgical Corporation, Philadelphia, Pa.

Alloy Steel Products Company, Inc., Linden, N. J.

Aluminum Company of America, New Kensington, Pa.

American Platinum Works, Newark, N. J.

American Zinc, Lead and Smelting Company, St. Louis, Mo.

Atlas Powder Company, Wilmington, Del.

Bell Telephone Laboratories, New York, N. Y.

Bethlehem Steel Company, Bethlehem, Pa.

Buffalo Electro-Chemical Company, Buffalo, N. Y.

Burgess Battery Company, Freeport, Ill.

Canadian Industries Limited, Montreal, Canada

Chrysler Corporation, Detroit, Mich.

Consolidated Mining and Smelting Company of Canada, Ltd., Trail, B. C.

Crane Company, Chicago, Ill.

Diamond Alkali Company, Pittsburgh, Pa.

Dow Chemical Company, Midland, Mich.

E. I. du Pont de Nemours & Company, Inc., Wilmington, Del.

Electric Auto-Lite Company, Toledo, Ohio

Electric Storage Battery Company, Philadelphia, Pa.

The Eppley Laboratory, Newport, R. I.

General Chemical Division, Allied Chemical & Dye Corporation, Marcus Hook, Pa.

General Electric Company, Schenectady, N. Y.

Gould-National Batteries Incorporated, Depew, N. Y.

Graham, Crowley & Associates, Inc., Chicago, Ill.

Great Lakes Carbon Corporation, Niagara Falls, N. Y.

Hanson-Van Winkle-Munning Company, Matawan, N. J.

Harshaw Chemical Company, Cleveland, Ohio

Hooker Electrochemical Company, Niagara Falls, N. Y.

Houdaille-Hershey Corporation, Detroit, Mich.

International Graphite & Electrode Corporation, St. Marys, Pa.

International Minerals & Chemical Corporation, Chicago, Ill.

International Nickel Company, New York, N. Y.

Mathieson Chemical Corporation, Niagara Falls, N. Y.

Metal & Thermit Corporation, New York, N. Y.

Monsanto Chemical Company, St. Louis, Mo.

National Carbon Division, Union Carbide and Carbon Corporation, New York, N. Y.

National Cash Register Company, Dayton, Ohio

Niagara Alkali Company, Niagara Falls, N. Y.

Norton Company, Worcester, Mass.

Pennsylvania Salt Manufacturing Company, Philadelphia, Pa

Potash Company of America, Carlsbad, New Mexico

G. Frederick Smith Chemical Company, Columbus, Ohio

Solvay Process Division, Allied Chemical & Dye Corporation, Syracuse, N. Y.

Stackpole Carbon Company, St. Marys, Pa.

Sylvania Electric Products, Inc., Bayside, N. Y.

Tennessee Products & Chemical Corporation, Nashville, Tenn.

Udylite Corporation, Detroit, Mich.

Union Carbide Company, Electrometallurgical Division, New York, N. Y.

United Chromium, Inc., New York, N. Y.

Vanadium Corporation of America, New York, N. Y.

Victor Chemical Works, Mt. Pleasant, Tenn.

Western Electric Company, Inc., Chicago, Ill.

Western Electrochemical Company, Los Angeles, Calif.

Westinghouse Electric Corporation, E. Pittsburgh, Pa.

Westvaco Chemical Division, Food Machinery and Chemical Corporation, New York, N. Y.

Willard Storage Battery Company, Cleveland, Ohio

Wyandotte Chemicals Corporation, Wyandotte, Mich.